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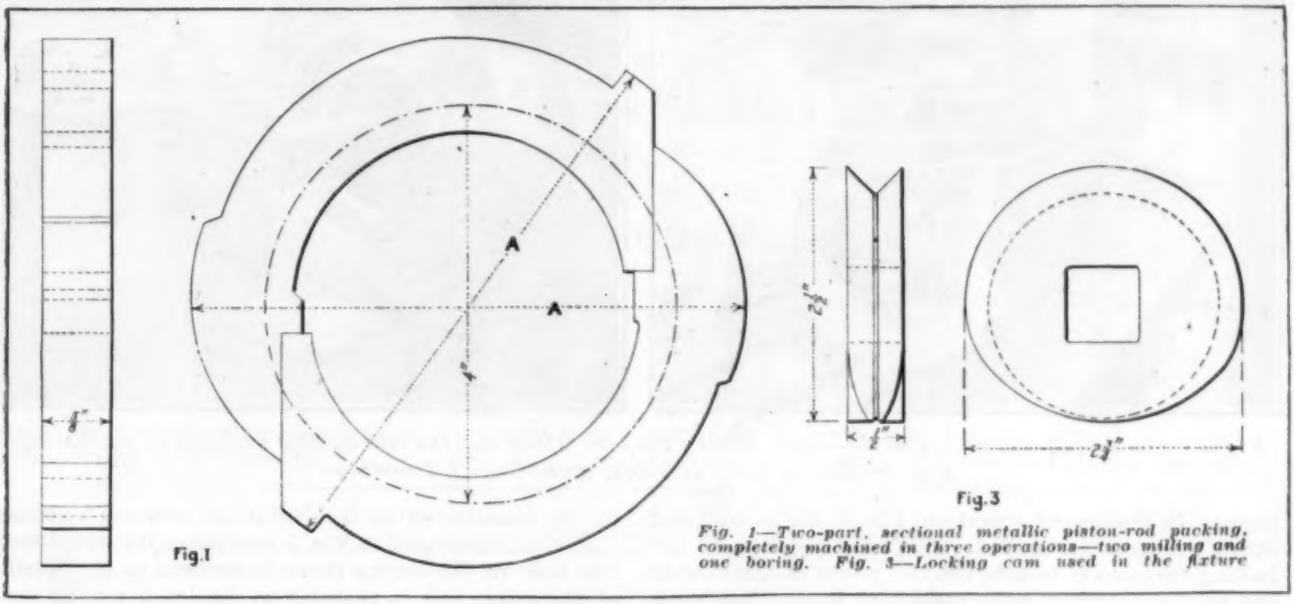


Fig. 1—Two-part, sectional metallic piston-rod packing, completely machined in three operations—two milling and one boring. Fig. 3—Locking cam used in the fixture

Sectional Metallic Packing

in Three Operations

By L. C. Morrow
Managing Editor, American Machinist

PAXTON and Mitchell sectional metallic piston-rod packing is machined in two milling and one boring operation at the Albina, Ore., shops of the Oregon and Washington R.R., division of the Union Pacific System. Each packing ring is made in two parts, as shown in Fig. 1, a line drawing of a ring for a 4-in. rod at a scale of approximately ½ in. = 1 in. In the drawing the ring is shown in its condition after the two milling operations, but before boring, the finish bore being indicated by dot and dash line. The castings are made of a composition of lead and copper. Twelve pieces (the equivalent of six complete rings) are held in the straddle milling fixture, Fig. 2, for the first operation, in which both sides are milled. The fixture consists of nothing more than a base, two vertical pieces with openings shaped to receive the castings, and the clamps, one of which is shown in Fig. 3 approximately half size. This clamp is a cam with a V of varying depth cut into its rim. The V fits over a male V in the fixture, and when the cam has been tightened, that half of the rim having the greater horizontal surface (the lower part in the illustration) bears against the packing-ring casting. A square-end wrench is used in tightening and loosening the cams. Without set-up the production on this operation is 500 pieces per 8-hr. day; with set-up it is 420

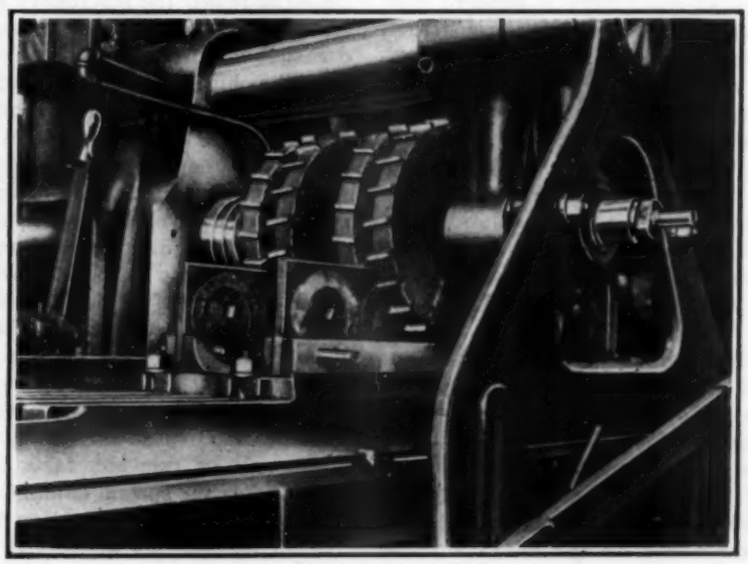
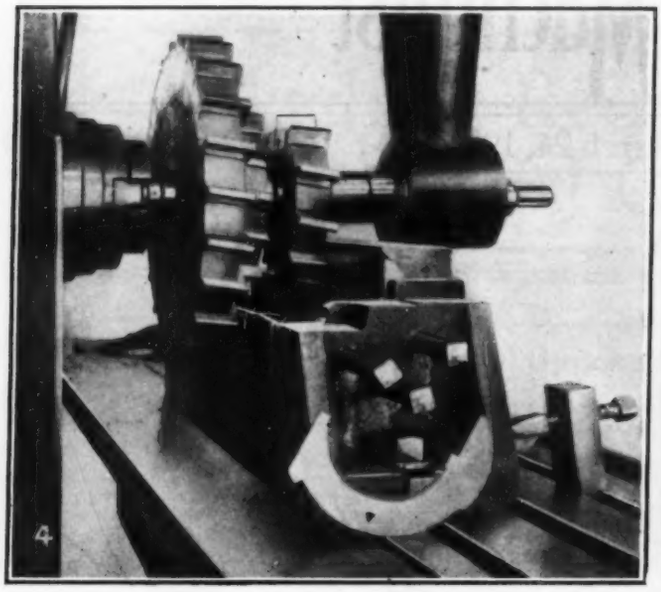


Fig. 2—Straddle milling the sides of 12 castings



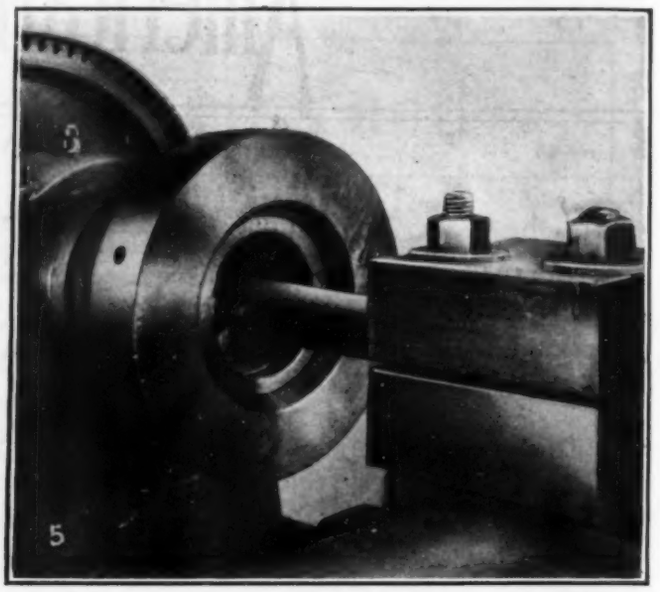


Fig. 4—The second milling operation—gang milling the two fitting and the two locking surfaces of 24 castings
Fig. 5—Boring a set of rings, consisting of 4 castings

pieces. In the second operation, Fig. 4, the locking and fitting surfaces are milled. The only function of the locking surfaces is to hold the two pieces of the ring in the proper positions with respect to each other while they are being clamped in the boring chuck. A box-type fixture, with three setscrews to do the clamping, and holding 24 pieces, is used in the milling operation. Production is 1,000 pieces per 8-hr. day without set-up, 900 pieces with set-up. By a gang of three cutters the two fitting surfaces and the two locking surfaces are milled. Any burring that is necessary is done by the operator as an incidental job between loadings.

Boring, illustrated in Fig. 5, completes the machining. The body of the boring chuck is screwed to the spindle of the lathe, and is recessed to receive a set, or four pieces, of the packing. It will be noticed, by referring to Fig. 1, that the diameters *A* are equal, and are the largest diameters of the ring. Thus four points are furnished for locating the rings in the chuck. Clamping is secured by a ring, threaded to fit over the outer end of the body of the chuck, and tightening against the face of the outer pair of packing-ring castings.

Damages for Improper Repair of Machinery

By Leslie Childs

THE question of the right of a manufacturing plant to special damages for the failure of one contracting to repair machinery to do the work properly has been the cause of much litigation. Generally speaking, where a contract for the repair of machinery is entered into, and the one making the repairs breaches the contract, the owner of the machinery has the right to such damages suffered, as were within the contemplation of the parties when the contract was executed.

The application of this rule of damages is illustrated in the case of a cotton oil company in North Carolina against an iron works. The iron works company undertook to make certain repairs upon steel columns and press boxes for the cotton oil company. At the time this contract was entered into, the cotton oil company gave the other notice that the work should be done promptly on account of the approaching season.

The iron works company made the repairs, and the machinery was shipped back to the cotton oil company and installed in its plant. Following this the iron works company presented a bill for $761.36, and the cotton oil company declined to pay it. The iron works company thereupon brought suit, and the cotton oil company filed a counterclaim for $6,800 for special damages.

This counterclaim was based on the allegation that the repairs to the machinery were defective, in that the press boxes were bent and improperly assembled; that as a result of this the cotton oil company experienced great difficulty in operating.

Upon trial a jury found that the iron works company failed to repair the machinery according to the contract, and that the cotton oil company was entitled to special damages of $1,000. The iron works company appealed, but the higher court reaffirmed the judgment and summed up the case in situations of this kind as follows:

"The items of damage claimed by the cotton oil company consisted of extra labor in operating the machines after the repair, decreased output, and also increased cost per ton of oil by reason of poor extraction.

"In the case under consideration, there was evidence of express notice to the iron works company of the particular use and function of the machinery in question. The general superintendent also testified that there was a quarter of an inch difference in the width at one end from the width at the other end.

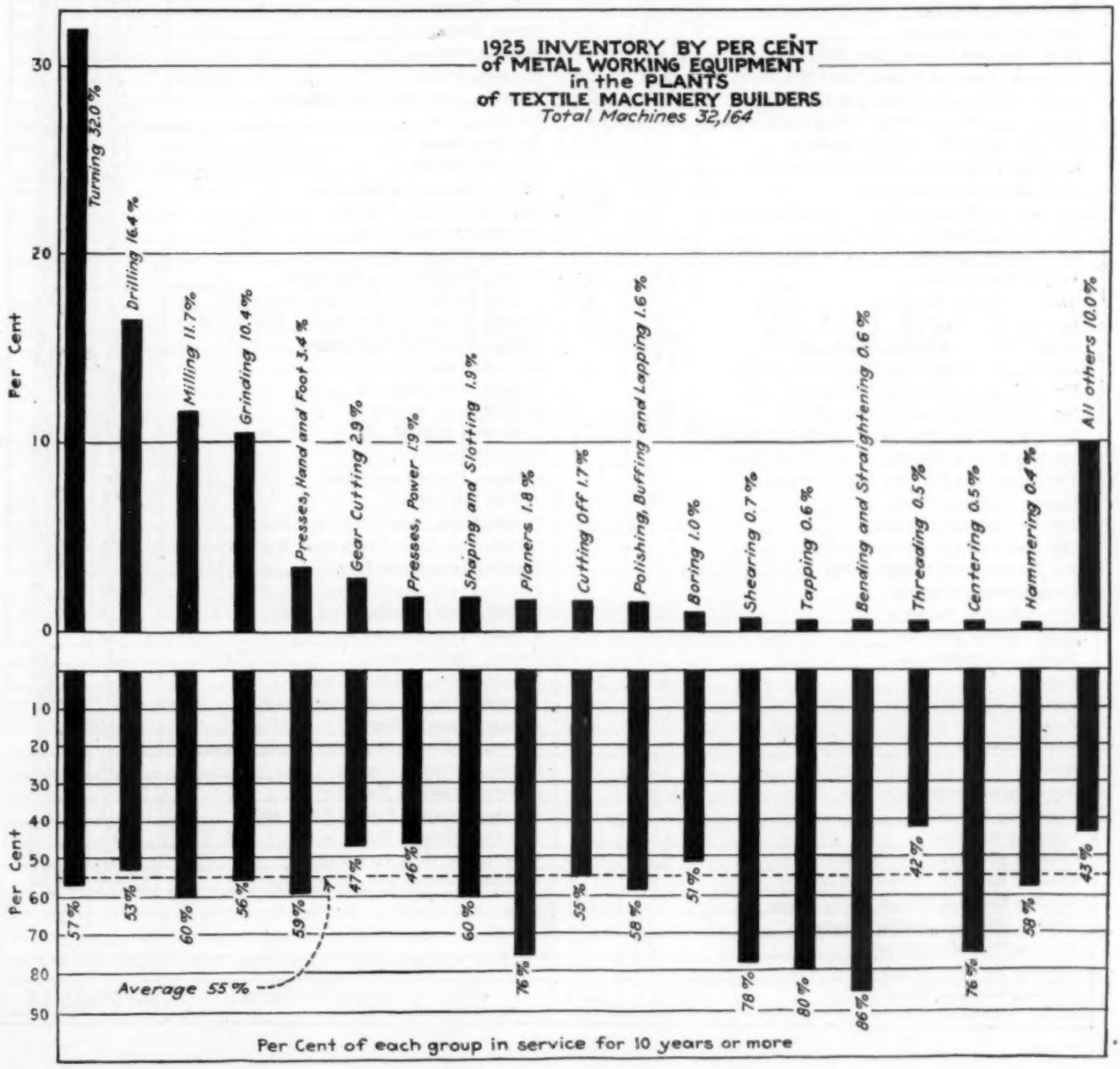
"There was therefore, in this case, ample notice of the special purpose for which this machinery was to be used, and of relevant facts and circumstances which would warrant special damages, upon breach of the contract. This is not an action to recover loss of profits, but to recover for additional labor and increased cost of operation."

Old Equipment Prevents Profit in Textile Machinery

To old equipment, indicated by a recent count, can be attributed an important share of the causes for the narrow profit margins secured in building textile machinery

OVER one-half, 55 per cent to be exact, of the metal-working equipment in the plants engaged in textile machinery manufacture, has seen ten years or more of service. This is a condition prevalent in a majority of the approximately 300 plants that constitute this division of the metal-working industries. These counts were made by the *American Machinist* through the medium of an equipment questionnaire to the division and shows that of a total of approximately 32,000 machines, nearly 18,000 have passed the ten-year point. The questionnaire is shown on the next page.

In the chart shown below, the machines are grouped according to operations and are plotted in terms of per cent of the total. The relative ages are also shown.



METAL WORKING MACHINES IN THE TEXTILE MACHINERY PLANTS

Kind of Machine Tool	A Number Built Before 1915	B Total Number in Plants 1925	Kind of Machine Tool	A Number Built Before 1915	B Total Number in Plants 1925
Engine Lathes	2,832	4,769	Grinding Machines, Floor, No Feed Attachments	1,050	1,413
Hand Turret Lathes	408	771	Grinding Machines, Bench, No Feed Attachments	110	285
Power Turret Lathes	578	998	Grinding Machines, Disk	110	161
Semi-Automatic Lathes	71	78	Grinding Machines, Belt	32	58
Hand Screw Machines	233	395	Grinding Machines, Centerless	13	32
Automatic Screw Machines, Single Spindle	305	881	Polishing and Buffing Machines, Wheel	233	395
Automatic Screw Machines, Multiple Spindle	84	246	Polishing and Buffing Machines, Belt	32	52
Chucking Lathes	233	389	Polishing and Buffing Machines, Semi-Automatic	32	45
Multiple Spindle Chucking Machines, Rotary Work	0	156	Lapping Machines	0	13
Multiple Spindle Chucking Machines, Rotary Tools	13	13	Honing Machines	0	0
Speed Lathes	920	1,153	Cutting-Off Machines, Parting Tool Type	78	97
Bench Lathes	32	78	Cutting-Off Machines, Power Hack Saw Type	143	279
Tool Room Lathes	156	272	Cutting-Off Machines, Rotary Cold Saw Type	71	110
Wheel Lathes	52	58	Cutting-Off Machines, Band Saw Type	13	58
Axle Lathes	6	13	Cutting-Off Machines, Friction or Hot Saw	6	13
Forge Lathes	6	6	Shears, Knife	156	207
Hand Milling Machines	130	246	Shears, Rotary	19	19
Bench Milling Machines	71	91	Shears, Slitting	13	13
Plain (Knee and Column Type) Milling Machines	1,160	1,756	Nibbling Machines	6	45
Universal (Knee and Column Type) Mill. Mach.	337	654	Hammers, Steam	6	6
Vertical (Knee and Column Type) Mill. Mach.	149	305	Hammers, Pneumatic (not portable)	0	6
Lincoln Type Manufacturing Milling Machines	156	220	Hammers, Drop	26	39
Semi-Automatic Type Milling Machines	71	180	Hammers, Helve	26	39
Continuous Mill. Mach. Rotary or Drum Type	32	45	Hammers, Spring	13	32
Planer Type Milling Machines	168	253	Riveting Machines, Pneumatic	0	0
Gear Cutting Machines, Rotary or Milling Type	311	648	Riveting Machines, Hydraulic	0	0
Gear Cutting Machines, Hobbing Type	130	259	Riveting Machines, Steam	0	0
Gear Cutting Machines, Planing or Shaping Type	6	32	Riveting Machines, Power	39	84
Vertical Boring Mills	136	240	Forging Machines, Hot, Bulldozers	0	0
Horizontal Boring Machines	32	84	Forging Machines, Hot, Forging Machines	32	39
Radial Drilling Machines	97	233	Forging Machines, Cold Headers, Bolt, Nut, etc.	0	0
Upright Drilling Machines, One Spindle	1,335	2,313	Forging Machines, Cold, Swaging	0	0
Upright Drilling Machines, Two or More Spindles	454	881	Bending Brakes	78	84
Upright Drilling Machines, Two or More Heads	71	175	Bending Rolls, Horizontal	39	39
Sensitive Drilling Machines, One Spindle	467	713	Bending Rolls, Vertical	0	0
Sensitive Drilling Machines, Two or More Spindles	175	622	Straightening Rolls	39	58
Sensitive Drilling Machines, Two or More Heads	0	0	Punching Machines	13	26
Two-, Three- and Four-way Drilling Machines	207	318	Combined Punches and Shears	6	13
Tapping Machines, Single	149	181	Presses, Hand, Arbor	382	551
Tapping Machines, Multiple	6	13	Presses, Hand, Light Punch Press Work	181	305
Pipe Threading and Cutting Machines	19	52	Presses, Foot, Light Punch Press Work	78	220
Bolt Threading and Cutting Machines	26	39	Presses, Power, Crank Type	207	434
Thread Chasing Machines	13	45	Presses, Power, Toggle Type	6	6
Thread Hobbing Machines	0	0	Presses, Power, Double-Acting Type	6	6
Thread Milling Machines	13	32	Presses, Power, Dieing Type	0	0
Thread Rolling Machines	0	0	Presses, Power Automatic	26	58
Planers	421	577	Presses, Power, Trimming Presses	13	19
Open-side Planers	0	0	Presses, Power, Forcing, Arbor, Wheel	19	45
Shapers	194	240	Presses, Power, Baling	0	0
Vertical Shapers	0	0	Presses, Hydraulic, Bending, Forming, Drawing	1	1
Slotters	168	356	Presses, Hydraulic, Forging	0	0
Broaching Machines	52	91	Presses, Hydraulic, Flanging	0	0
Keyseating Machines	26	59	Presses, Hydraulic, Forcing, Wheel, etc.	0	13
Centering Machines	110	143	Presses, Hydraulic, Baling	0	0
Grinding Machines, Plain Cylindrical	227	447	Presses, Hydraulic, Extruding	0	0
Grinding Machines, Universal Cylindrical	65	136	All other machines and miscellaneous,	1,244	2,974
Grinding Machines, Surface, Reciprocating	52	201			
Grinding Machines, Surface Rotating	13	117			
Grinding Machines, Internal	32	78			
Grinding Machines, Cylinder	39	97			
Grinding Machines, Cutter	143	324	Total	17,989	32,164

Automotive Production

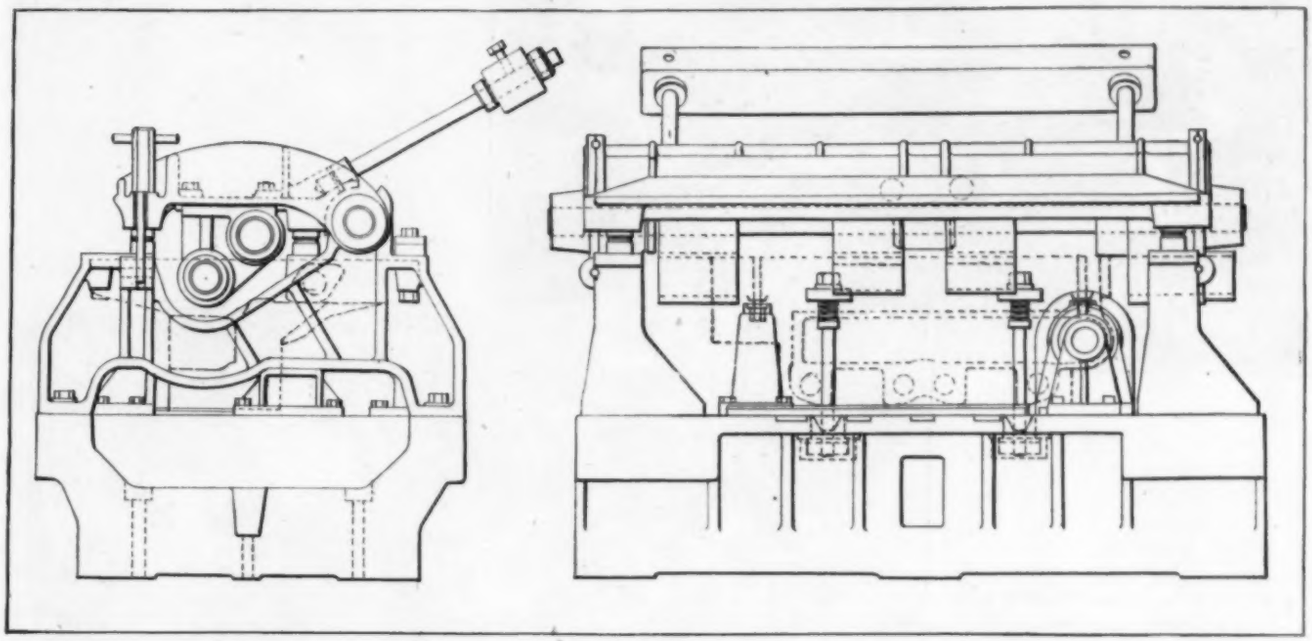


Fig. 26—Jig for machining camshaft bore

Machining the Morris Cylinder Block

By I. William Chubb
Editor, European Edition, American Machinist

Electrically-driven special machines perform a number of drilling and boring operations—Attachment for pressing in bushings—Milling the camwheel clearance

THE next series of operations is done with a number of electrically-driven universal heads which, in combination with multi-spindle boxes, are assembled as horizontal or vertical automatic machines, or as inclined heads for a variety of purposes. The heads are compact and easily adaptable to requirements and, being built to standard design, any parts are readily replaced in case of accident. They may be built up with two or more heads that are electrically interlocked to prevent fouling, or instead in some cases, with boring bars, etc., in line, the end of one may be bored to take the end of the other. All the heads are similar, but by variation of the gearing, different spindle speeds are obtained according to requirements. Forced feed lubrication at 40 lb. is employed, each head having its own pump and tank, and the oil being delivered to a junction box from which it is distributed to the various parts. The flow can be adjusted in the usual way, and the oil travels back to the tank if necessary by by-passes, all surplus oil running to the bottom of the head, which forms a sump.

The drives are obtained by motor-driven, constant-speed shafts provided with change gears, much as in the lathe, and then if these speeds are not suitable, changes can be made in the multi-spindle boxes which drive the various drills, etc., and which are bolted to square

The fourth article. The concluding article will appear in an early issue.

Automotive Production

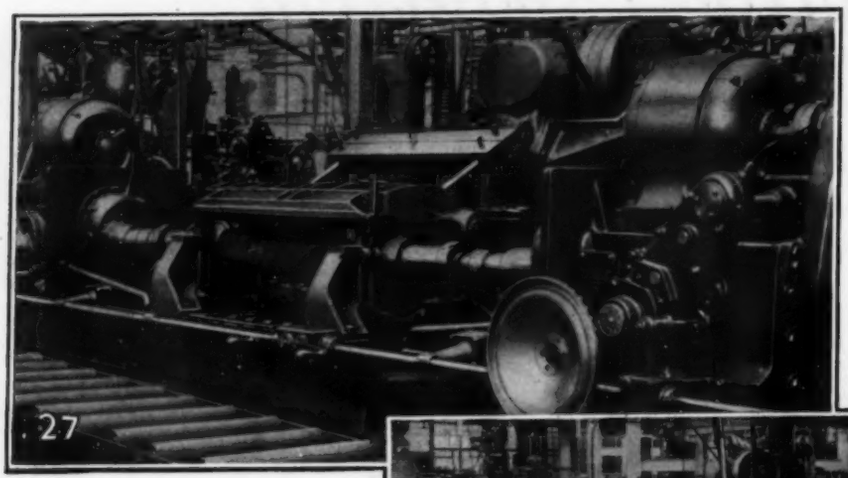


Fig. 27—Rough machining camshaft bore

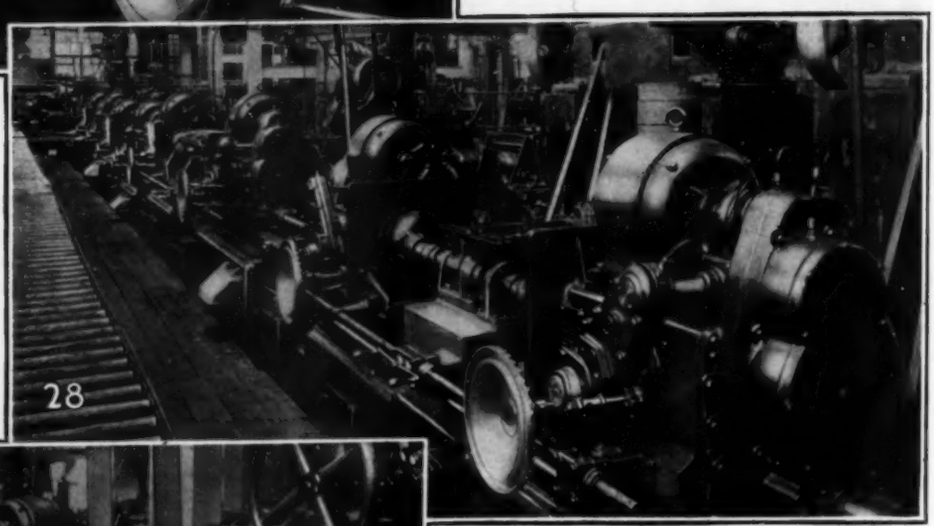


Fig. 28—Battery of universal-head machines

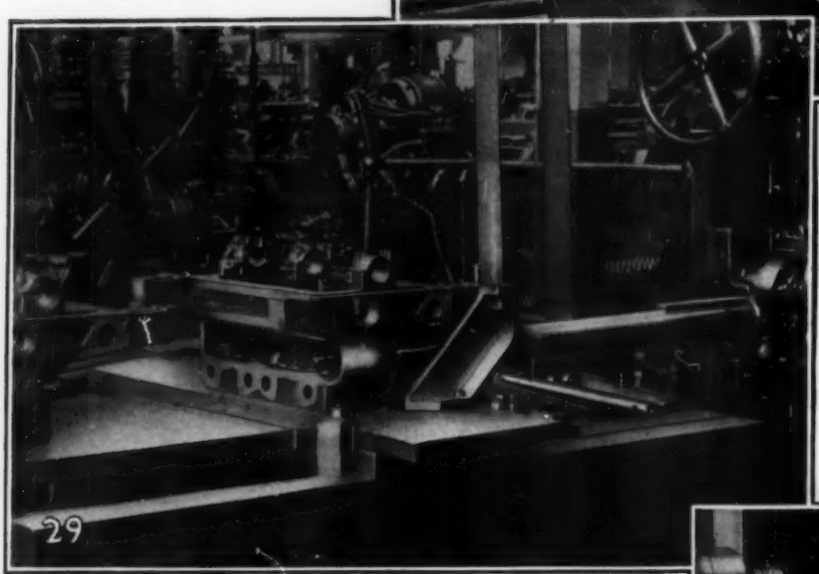


Fig. 29—Miscellaneous operations

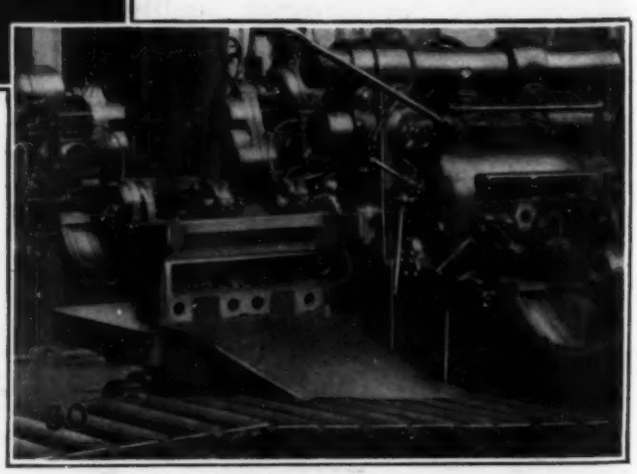


Fig. 30—Milling cam-gear clearance

Automotive Production

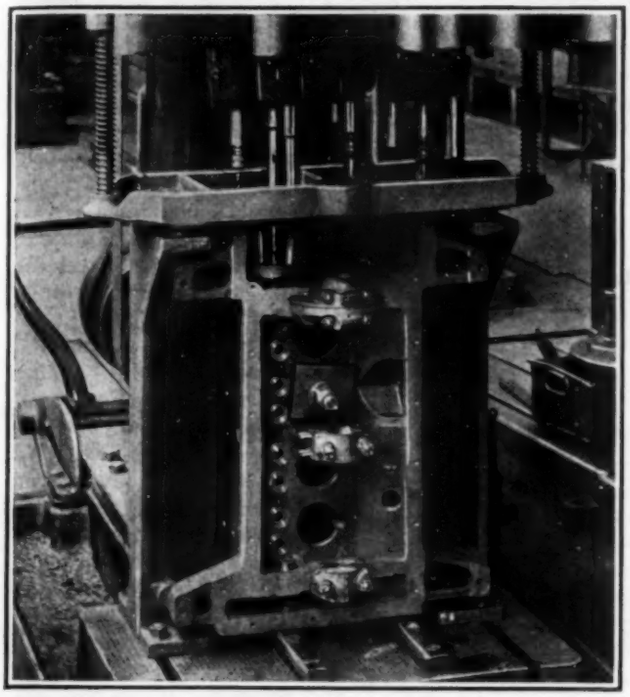


Fig. 31—Drilling the flywheel end

flanges formed on the fronts of the heads. The feeds are obtained by a screw that can be removed and varied as required. Thus in one machine, the range is from 0.002 to 0.48 in. per revolution. Automatic changes in rate of traverse are effected by clutches and adjustable trips.

Slow-cutting and quick-return motions are obtained, the drive being taken from a constant-speed shaft through a train of gears to a cross-shaft with clutch and reverse gear, finally running through a wormwheel drive for the slow speed, and the wormwheel, being stationary, forms a nut. For the fast feed, the screw revolves at cutting speed and the worm is revolved by gear.

Final facing is always a hand operation. This applies to finishing faces where the limits are fine. For rough facing, the automatic stops are used. For hand facing, the clutch is placed in the neutral position and consequently there is no motion of the worm, the wormwheel being revolved by hand around the stationary screw.

The machines are built-up by taking slides and one or more standard heads as required, the gearing being arranged according to the speeds and feeds desired. The center of the bed carries a jig for the work, also a tank. Interlocked motors at each end complete a duplex machine. For a vertical head, a square column is used, with a knee that carries the work jig. The pump is placed on the floor. In the case of the multi-spindle machines, the motors, as mentioned, are interlocked to prevent overrunning of the cutter bars, one motor being arranged to reverse before the other, to prevent the bars from fouling.

The camshaft bore is core-drilled in a built-up machine of this type, the drilling, stripping and facing of the magneto shaft bore following. For the former, the fixture used has a cast iron base with steel runners on which the work rests, with locating brackets for the arm holes. Hardened steel strips are preferred, for swarf-clearing reasons. Clamping is by bolts through the two outside cylinder bores. The plate that carries guide bushings for the bars, is balanced about the center and is clamped by two swinging latch bolts to two outer supports (see Fig. 26). The cutting speed for the camshaft bores is 55 ft. per min. and the feed 3.6 in. per min. Similarly, the cutting speed of the core drill is 36 ft. per min. at the same feed, and of the stripping and facing tool 61 ft. per min. The rough boring and facing of the camshaft bore (Fig. 27) is done at a cutting speed of 35.5 ft. per min. and a feed of 2.1 in. per min., the rough boring and recessing tools for the magneto bore running at 50 ft. per min., and the finish facing tool at 50 ft. The finish-boring of the cam and crankshaft bores, and the finish boring and facing of the magneto shaft bore, are done in similar machines, except that they are three-headed, and the jigs are the same except as regards the bushings. The reaming tools used cut at speeds of from 35 ft. to 40 ft. per min. The runway is used for the inspection which comes next. The general view, Fig. 28, shows a line of these special machines on various operations.

A series of miscellaneous operations follow, beginning with the facing of the camshaft bore in a horizontal machine to gage width. An attachment (see Fig. 29) is provided for pressing the bushing into place in the magneto shaft bore, both ends of the magneto shaft bushing being faced and the bushing reamed in position. Next, the cam wheel clearance (Fig. 30) is milled, the cutter feeding up and across clearance and then to the other face. Then the flywheel end and the camshaft cover are drilled in a multi-spindle machine, Fig. 31, with the cylinder block on end and clamped in a vertical position against the spot faces, the drill plate being carried on the machine head as previously described.

Artificial Daylight for Inspection Work

FOR a number of years artificial light of a daylight quality or color-value has been available. Thousands of lighting-units providing light simulating north skylight, average daylight, and noon-sunlight are in use where accurate discrimination of color is desirable. The tungsten-filament "daylight" lamp (with blue-green bulb) was designed as a compromise between efficiency and daylight quality; that is, to provide an approximation to average daylight. Many millions are now in satisfactory use for general lighting in industries and they solve many inspection problems.

Among the many applications where these lamps are now successful are in inspecting nickeled brass parts, small ground steel parts, finished brass bearings, and for finding scratches, flaws and chips in metal surfaces. These are examples where color-vision is not ordinarily considered important but there are many such uses in shops. In cases where color is conspicuous obviously the tungsten-filament "daylight" lamp is useful. They are widely used in the automobile industry, besides the cases sighted, in body conveyor-line work including painting, upholstering, and leather inspection.

An Improved Invoice Form

GENERAL interest in a uniform invoice form has been aroused by the two suggested standards put forward by the Ford Motor Co. and by the National Association of Purchasing Agents. Both forms have many good features.

The new form just adopted by the Cincinnati Bickford Tool Co. is a development of the others that has much to recommend it. The essential items above the double horizontal rule follow the Ford form rather closely, as will be evident in the illustration. Below the line the "Quantity" column has been moved over so that it is adjacent to the "Unit Price" column, a step that simplifies the checking of extensions.

The form is printed on letter-size sheets, partly for the sake of appearance as the large amount of material above the rules would make a shorter sheet look top-heavy.

THE CINCINNATI BICKFORD TOOL CO.

METAL DRILLING MACHINERY

OAKLEY, CINCINNATI, O., U.S.A.

INVOICE NO. DATE

SOLD TO

FOR CUSTOMER'S USE

TERMS
F. O. B.
ACCOUNT
APPROVAL
TRANSPORTATION
RECEIVAL
CALCULATIONS
ADJUSTMENT
AUDITED

YOUR ORDER NO. DATE
SHIPPED TO

SHIPPED FROM
F.O.B. TERMS
SHIPPED VIA

DESCRIPTION	QUANTITY	UNIT PRICE	AMOUNT

Uniform invoice form adopted by Cincinnati Bickford Tool Co.

Welding and the Welding Rod

MANY people have the idea that the personal equation is the difficult problem in welding. True, you must have good welders but they must also have good materials to work with.

The best of blowpipes and the highest grade of welding rods and fluxes will so facilitate welding that their use will be soon repaid many times over. Since one of the most important of these items is the rod, the largest manufacturers of welding equipment and supplies are devoting great attention to developing new and improved welding rods.

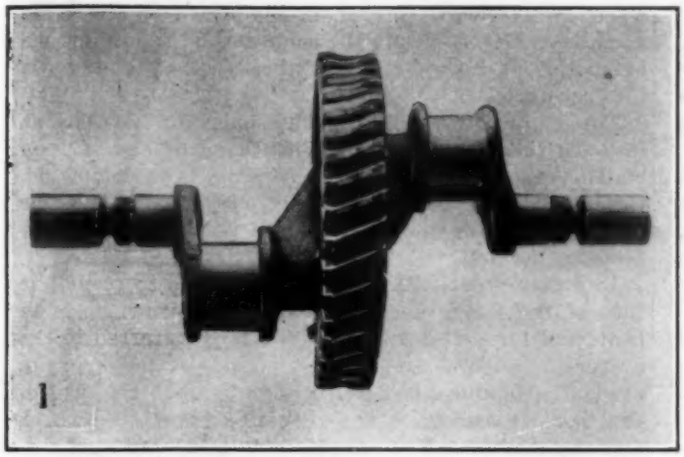
One of the simpler tests to determine the excellence of a rod is to place it on a welding table so that one end extends well over the edge and then melt it with a blowpipe, watching for impurities or cavities. A good rod will melt easily and quietly with practically no sparkling. Another good test can be made by laying the rod on a metal slab and then remelting it several times in succession.

The first time the blowpipe has been moved slowly along, there should be no excessive sparkling, and no pin holes should remain in the melted metal. A second or third application will show proportionately more sparkling and a larger number of pin holes. But if there is a great increase each time the rod is not of very high quality. Any operator can make this test without much trouble.

A good rod gives a good weld because it has no impurities to be left in the weld metal and no gas pockets to prevent steady and smooth flow. In actual work the operator can recognize a good welding rod with no trouble at all. The rod should flow easily without excessive sparkling; it should be easy to control even in overhead welding and should be capable of being worked rapidly. For most work another prime consideration is strength; a good welding rod should give a weld which when properly made is stronger than the best quality of flange steel or boiler plate. One of the first types of rod used extensively for oxy-acetylene welding was of almost pure iron from Norway and Sweden. When the supply of this material was cut off during the early years of the World War, the low carbon steel or so called "drawn iron" rods replaced them. "Norway Iron" has therefore lost its precise meaning; most of the welding rod called Norway iron is merely a low carbon steel made in the United States especially for its welding properties. The weld metal resulting from its use is practically pure iron, and contains only 0.02 to 0.03 per cent of carbon. Consequently joints made with this rod, while tough and ductile, are no stronger than the softest staybolt iron.

An important factor which must be anticipated in the development of new welding rods is the change in chemical composition which takes place when they are melted by the blowpipe flame. Consequently they must be of such composition that the metal in the weld will be of high quality, sound and strong.

An important development in welding rods is the recent "High Test Rod" put on the general market in 1925. Prior to this, from 1923 to 1925, operators employed in railroad shops all over the country used this type of rod. It was their success with it that created the general demand. Welds made with this rod, whether by second rate or by the best of operators, will regularly average 11,000 lbs. per sq.in. stronger than welds made by the same man with a low carbon steel rod. It is an alloy steel, its essential chemical composition being carbon 0.20 per cent; manganese 0.80 per cent; silicon 0.55 per cent. The weld metal retains nearly all the carbon. The manganese and silicon lost in melting act as a self-flux. Every welding operator, and every manager who directs welding operations, will find that quality and correct composition are matters of utmost importance.



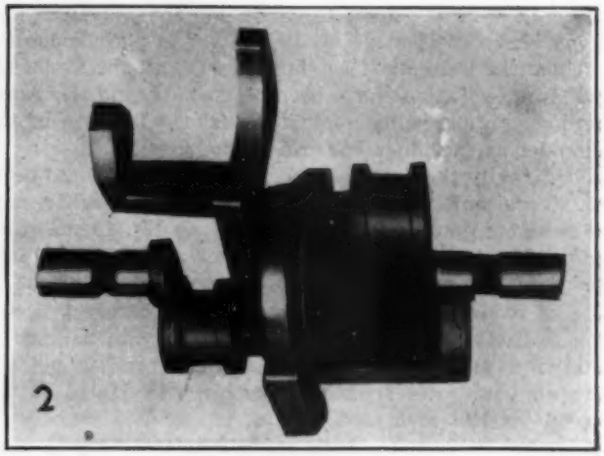


Fig. 1—The finished crankshaft. Fig. 2—Gages to establish position of shoulders

A Difficult Job of Production Grinding

THE small, double-throw crankshaft shown in Fig. 1 is a part of an apparatus that is expected to run for long periods of time with little or no attention, to be subject to wear in the smallest possible degree, and to be quiet in its operation. In consequence of the exacting requirements, the job of making it is one that involves more than an ordinary degree of accuracy. Limits of but ±0.0002 in. in the matter of diameters are allowed, and when it comes to roundness, particularly of the crankpins, the makers are reluctant to allow any variation at all.

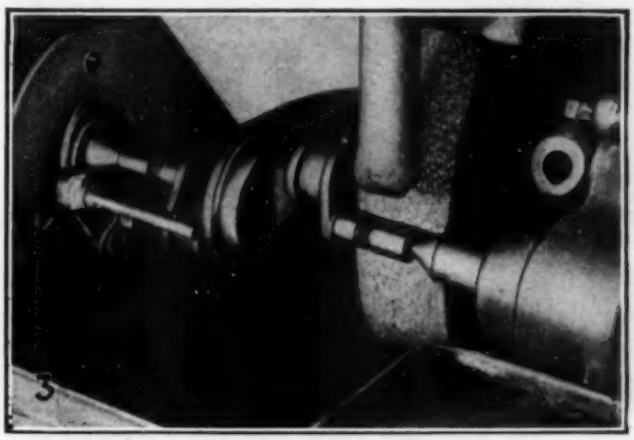
The shaft itself is a drop-forging, carbonized and hardened all over. The bronze wormwheel through which power is applied, is attached by means of rivets which draw it tightly against a ground flange, integral with the shaft, and the teeth are cut by hobbing after the wheel has become permanently a part of the unit.

There is little machine work upon the shaft before it is hardened, that little being confined to turning and facing the seat for the reception of the wormwheel blank, rough-turning the journals, cutting a thread near each end, and necking each journal, so that the superfluous metal can be broken off after the centers by which the work is supported during the grinding operations have served their purpose.

The job is in regular production at the plant of the Brown & Sharpe Manufacturing Co., Providence, by the courtesy of which the photographs and data for this article were secured. Since the more difficult of the production problems are encountered in the grinding room, that part only of the work will be considered.

Two types of grinding machine are used: the No. 11 plain grinding machine and the No. 2 universal grinding machine, both of which are regular products of the above company. The wheels are of Alundum, with vitrified bond.

The chief reason for using two types of machine is that, because of the small section of the piece to be ground, it is undesirable to undercut the shoulders, and it is therefore necessary to grind sharp corners in solid



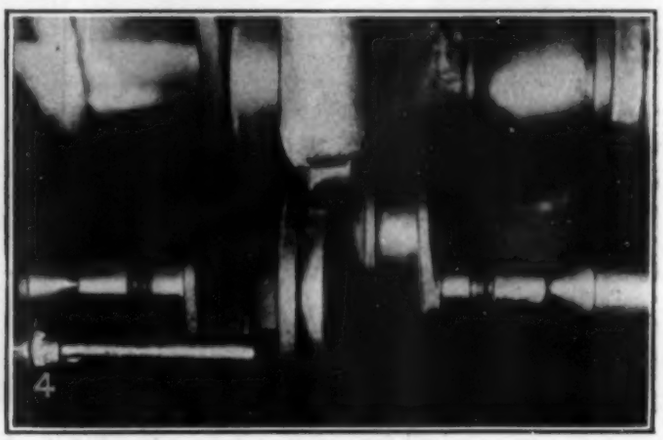


Fig. 3—Grinding the journals. Fig. 4—Grinding diameter of middle shoulder

metal in several places, to which job the universal machine lends itself more readily than the plain machine.

Upon the bare shaft as shown in Fig. 2 the first four grinding operations have been performed, and the gages here shown are being applied to test the location of the shoulder at the inner ends of the journals.

Ordinarily the first and second operations would be to rough and finish grind both journals, for which the part is swung up on its own centers in the No. 11 machine, and reduced to rough and finish sizes successively. Both journals are considered as one operation, all pieces of the lot being handled through one stage before proceeding to the next. The piece is practically in balance at this time and little difficulty is experienced in holding the diameter and roundness within the 0.0002 in. allowed on the finish size.

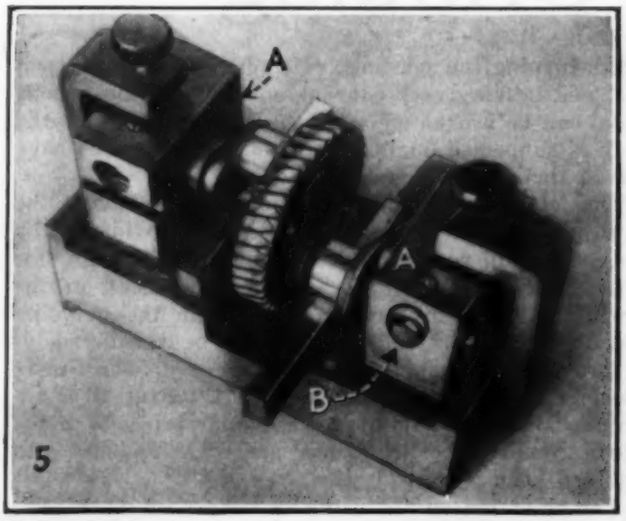
The wheel used for both operations is a 3836-L, wide enough to cover the length of the journal plus the extra length that is to be broken off. The wheel is fed straight in to the cut without traverse, and the micrometer dial of the cross-feed can be depended upon to produce the desired size. A micrometer caliper in the hands of an expert operator keeps a check upon the work. Fig. 3 shows the set-up, which is the same for both roughing and finishing.

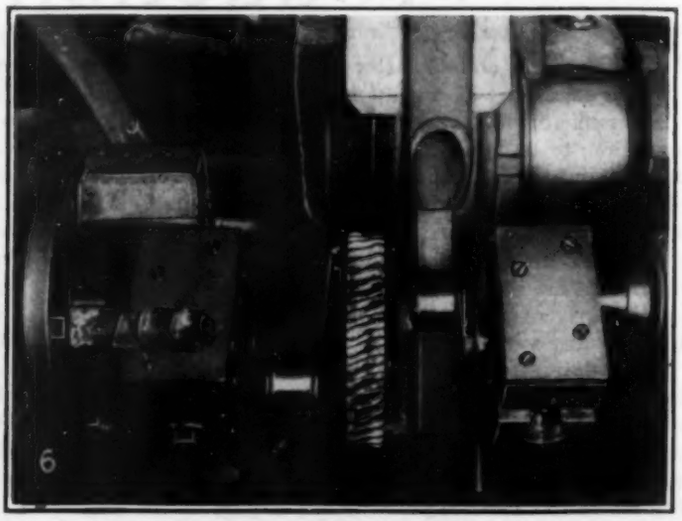
The third operation, grinding the diameter of the narrow seat midway of the shaft, upon which the wormwheel is afterwards forced, is performed on the same machine with practically the same set-up, the difference being only in the width of the wheel face. Fig. 4 shows this set-up.

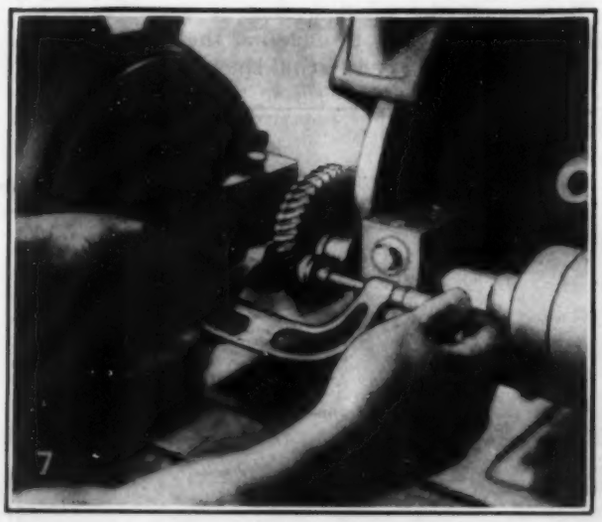
The reason for changing the sequence of operations is to be found right here. When a lot of shafts upon which this operation is the third, has been completed, the next lot will be carried along on the same machine without changing the wheel, hence the third operation becomes the first.

In either order, the fourth operation is to grind the face of the flange against which the wormwheel is to bear, and for this purpose the job is transferred to the universal machine. A "dish" wheel of 3860 grain, grade J, Alundum, is beveled slightly upon its cutting face, corresponding to the side of a plain disk wheel, and the wheel head of the machine is swung to a corresponding angle in order to bring the wheel to bear flatly upon the work. This shoulder is the only one that has previously been undercut, and the sharp corner of the wheel is not broken down so rapidly as in the later operations. The feed movement is obtained by traversing the work table by hand to bring the wheel into action, and holding it there until the cut dies out.

Since this flange is the point of departure from which all other shoulders of the piece are located, much depends upon the judgment of the operator who does the







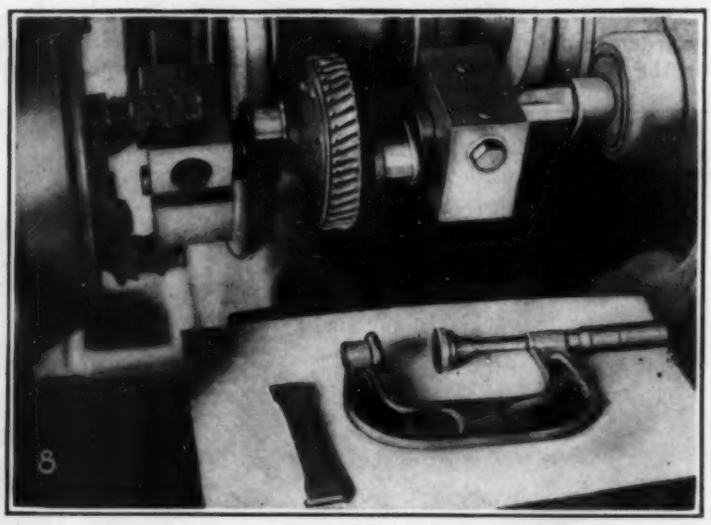


Fig. 5—Jig to set up for grinding crankpins. Fig. 6—Grinding the crankpins. Fig. 7—Gaging distance to shoulder of pin. Fig. 8—Grinding outer shoulder of pin

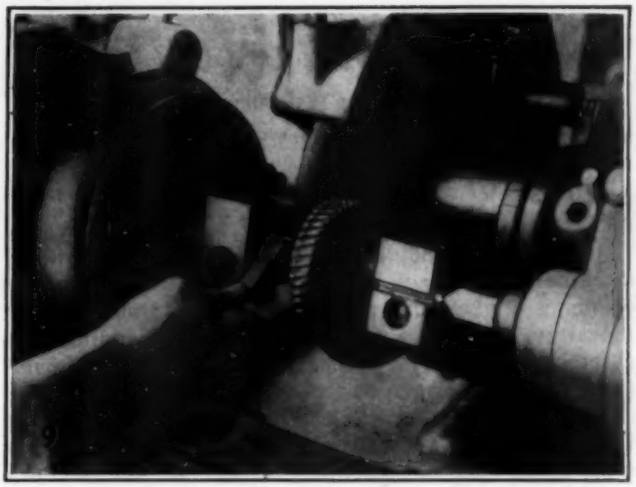


Fig. 9—Gaging length of pin.

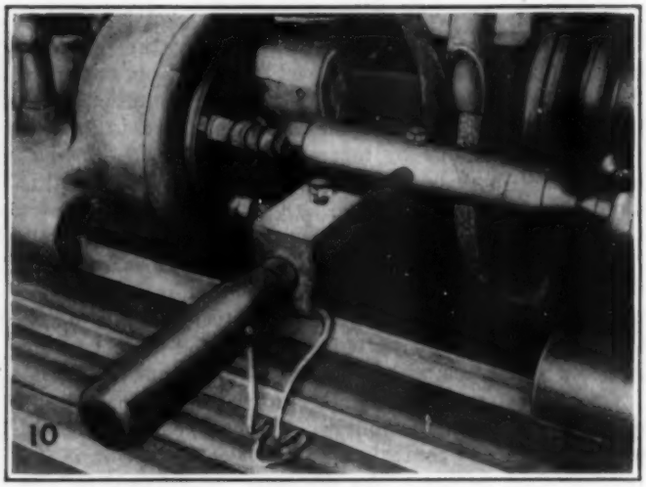


Fig. 10—Dressing the wheel

grinding. The amount of stock left by the lathe for grinding has been determined by experience to be sufficient to clean up the flange under the most exaggerated condition of warping likely to occur in the hardening, therefore if the flange wabbles badly when the grinding is started, the wheel is allowed barely to take out the tool marks on the low side. On the other hand if the flange starts fairly true, the surface must be carried back all around.

A quite different condition obtains on the next job, which is to square the shoulders at the inner ends of the journals. The same machine and set-up are employed, but a finer-grained wheel—3880 grain, grade J—is substituted. This shoulder is not undercut, and the periphery of the wheel is expected to pick up the already finished diameter and carry it clear to the shoulder with practically no fillet.

The gages shown in Fig. 2 are applied to the work to determine the location of the shoulders. The gages are alike except that the bearing surface of one is outside the large yoke while on the other one it is inside. A tolerance of minus 0.005 in. is allowed.

Having reached this stage in the grinding, the shafts go to the gear department to receive the wormwheels. The bronze blanks are forced on to their bearings and are further secured by rivets passing through holes previously drilled in the flange. The wormwheel teeth are then cut on a hobbing machine, with the assembled part held in a fixture that allows the shaft to rotate upon its own journals.

The crankpins are next ground to size from the rough in one operation, a condition made necessary by the fact that the piece must be supported by throw-blocks from which it cannot be removed until all of the offset work is done. A 3860-L wheel, 0.015 in. narrower than the finished length of the pins, is used, leaving to another operation the job of squaring the shoulders at the ends of the pins. The crankpin grinding is the most difficult and exacting operation, for the reason that the piece is badly out of balance when swung upon the offset centers of the throw-blocks, and must be balanced from a point outside itself, making it difficult to secure true roundness.

A pair of throw-blocks—*AA*, Fig. 5—have hardened-steel split-bushings midway of their length to fit the journals of the crankshaft, and are provided with means of clamping them tightly upon those journals. Each block has also two plug centers, one to correspond with the centerline of each crankpin. A block is placed upon each journal and the assembled unit set into the jig, to be lined up with the offset centers.

The throw-blocks are clamped in the jig by tightening the knurled-head screws to be seen at the top of the end brackets, securing the throw-blocks in their relative position but leaving the crankshaft free to turn in the bushings.

Two hardened-steel wedges having graduation marks at regular intervals across their tapered upper surfaces, are placed under the pins, one from the front and one from the back of the jig, and by entering each wedge to the same graduation mark the crankpins are so adjusted with relation to the centers of the throw-blocks, that any slight inequality that may exist in the forging is compensated and the pins will clean up to the respective centerlines. The split bushings are then clamped on the journals by means of the drawbolts, the head of one of which may be seen at *B*, and the assembled unit is taken out of the jig. The blocks are not again loosened until all the grinding has been completed.

Next comes a series of operations, performed in sequence by one operator who uses two machines. The pins are ground to diameter on the plain machine to be seen in Fig. 6, using a 3860-L wheel and gaging the sizes with an ordinary micrometer. After finishing one pin to size, the wheel slide is run back by giving the handwheel of the cross-screw a definite number of turns, the piece is turned end for end on the centers of the machine and the grinding wheel is brought forward to its previous position by counting the turns of the handwheel. The balancing weight can be seen on the drive plate of the machine, and also one of the two cloth-wrapped driving pins between which one of the throw-blocks is confined to forestall backlash and chatter.

Having finished both of the pins to size, the operator transfers the job to a universal machine adjoining, upon which is a 3880-J wheel of comparatively narrow width. With this setup, shown by Fig. 7, the inner corner of one of the pins is ground. The thickness of the wormwheel being held to close limits and the wheel itself drawn tightly against the ground face of the flange, it is safe to locate the shoulder by measuring over the wormwheel as here shown. To grind the corresponding shoulder on the other pin, the job is again turned end for end upon the centers.

Removing the work from the centers and traversing the table a definite distance to the right, the operator brings the same side of the wheel into position, as shown in Fig. 8, to grind the shoulders on the outer ends of the pins. The outer shoulder in each case is located from the inner one by means of a "go" and "not-go" gage, which may be seen beside the micrometer in this illustration. The limits are ± 0.002 in. Fig. 9 shows the manner of applying the gage.

The micrometer used to establish the measurement from the side of the wormwheel to the inner shoulder is a standard tool having ground steel disks fitted to the anvil and measuring spindle, to enable it to be used between shoulders where it would not otherwise go.

On all of the shoulder grinding operations it is essential that the periphery of the wheel be dressed parallel with the centerline of the work, since it is depended upon to carry the diameter established by the first wheel, clear to the corner of the shoulder without leaving a ridge or depression. The wear falls entirely upon a very narrow band at the corner of the wheel and frequent dressings are necessary.

In Fig. 10 is shown the manner of mounting the diamond. The bar is of the same length as the assembled workpiece, and is placed between the centers of the machine. The diamond is set to protrude beyond the centerline a known distance. By noting the reading of the micrometer dial on the cross-feed screw at the moment of dressing the wheel, the operator can, by advancing the slide a distance equal to the difference between the two known radii, reach finish grinding position without necessity for the excessive caution with which that point would have to be approached if he did not know exactly where it was.

Circus or Engineering Meeting? —Discussion

By Chester B. Hamilton, Jr.

THE editorial on the A.S.M.E. December meeting in the *American Machinist*, p. 1044, Vol. 65, was read and considered carefully. I wish to oppose very definitely the suggestion made in the fourth paragraph that "technical matters could be discussed at the meetings of professional divisions held at convenient times and places during the year." The conflict of interest at a general meeting such as that just passed affects a minority of the features and a minority of the men. Why upset the whole for this? Even considering the case of those who have found the difficulty mentioned in placing their time of attendance at meetings in a way to cover all their desires, these are the men of considerable breadth of interest who wish to attend meetings on quite different subjects at the same time. These same men would be in much worse case under the arrangement suggested, for they would be forced to expend the time and money to make long trips to several different parts of the country to attend these same professional sessions. Most people cannot do this and the natural outcome would be that the average specialist would lose the benefit of his professional meetings in his own particular group, as well as the average general-interest attendant losing the benefit of any professional meeting at the general meeting which he does attend.

Seen and Heard

By John R. Godfrey

Longshoremen demand machinery

TIMES change in every line of industry as well as in gowns and customs. The introduction of machinery to replace human labor has been the cause of many strikes and not a few riots. But in many industries men and women are now demanding machines to relieve them of much of the labor, even though they know it shortens their hours on the job.

There are now many cities in which it is hard for the housewife to get a women to do her washing unless a modern washing machine is part of the laundry equipment—and even ironing machines are finding favor with the ladies who condescend to do our laundry work.

Longshoremen have long fought the adoption of labor-saving devices, but even they are now falling in line. Not long ago a ship docked in New York with a lot of heavy oil in her cargo. This oil is about the consistency of molasses in the winter, and it comes in barrels or hogsheads that weigh about 600 lb. each, not just the sort of package to sling on your shoulder and carry down the gang plank.

The usual way is to sling the containers over the side and roll 'em along the dock, with the result that the staves work on each other, the sticky oil oozes out and gets all over the dock, wasting more or less of it as it goes along. The longshoremen got together and decided they'd had enough rolling and walking in muck to last them the rest of their natural lives. They'd seen industrial electric trucks working around nearby places, and, though they hadn't cottoned to the idea of using them in their own work, the 600-lb. oil casks did the trick as no amount of arguing could.

The longshoremen not only wanted the trucks but they wanted 'em so bad they wouldn't touch the cargo till they got 'em. And, since there were none available at the moment, the ship lay at the dock nearly two days before unloading was started. Then the new power trucks came; the men were satisfied; the casks were unloaded in less time than ever before; there wasn't any oily mess on the dock or on the men's shoes; and everybody was happy.

The call for labor-saving machinery is a very significant sign of the times that works both ways. The old-time employer didn't think the worker earned his money unless he became physically tired out. And the old-time worker could only see unemployment and privation as a result of machinery. Both now have a saner view of things and realize that machinery can help both sides. Also, that unless it does help both sides, there's something wrong in the way it is used.

Painting and cleaning the interior of poorly illuminated and slovenly appearing shops often will improve the quality of workmanship. It is hard to measure the direct returns from painting and cleaning, but it is safe to say that after the appearance of a shop and surroundings has been brightened up, there will be marked improvement in the quality and quantity of the work, as well as a better attitude of the workers.

Making Two and One-Half Million Blanks Every Day

Sub-presses, equipped with duplicate sets of tools, blank two blades at once—Arrangement and operation of punches and dies

By ELLSWORTH SHELDON
New England Editor, American Machinist

PERMANENTLY fastened to the bed of the press, with its body passing through the large clearance hole in the latter, is a fixture in which is confined a large coil spring made of square-sectioned steel. From a disk resting upon this spring, six pins extend up through the casting and terminate flush with its upper surface, which is to all intents and purposes the press bed itself, since the fixture is never disturbed when changing sub-presses. The gib clamps that secure the sub-press in place are attached to this surface. From a circular plate within the sub-press—the actual stripper—a similar number of correspondingly placed pins extend downward through the base of the sub-press and terminate flush with its under surface. When the sub-press is clamped to the fixture it is so located that the two sets of pins coincide, one set forming an extension of the other, so that the stripper actually rests upon the spring beneath the press bed. The line drawing, Fig. 5, shows a section of the tools, in which *I* represents the base of the sub-press. The construction may easily be followed. The 3½-in. width of stock permits two blanks to be cut with their length crosswise of the strip, by offsetting the tools one-half the width of the advance and interlocking the rounded ends of the blanks. Each sub-press thus has two complete sets of cutting tools, and blanks two blades at each stroke of the press. At a press speed of 350 r.p.m., 700 blades per minute are accounted for. Fig. 6 shows the layout.

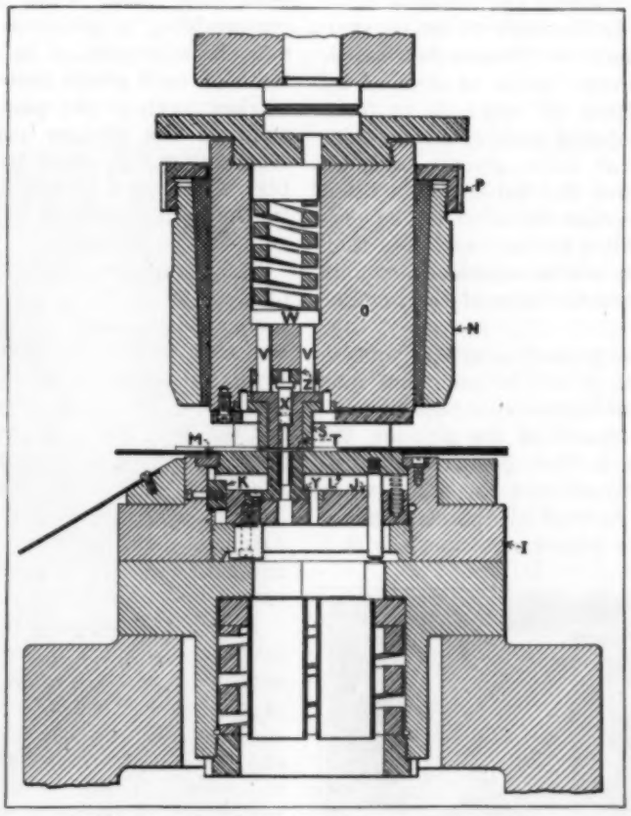


Fig. 5—Section of sub-press and tools

In Fig. 7 may be seen all of the parts of a sub-press that has been disassembled for regrinding the tools. The lower tools are the blanking punches, and also the piercing dies. They are not supported directly by the base of the sub-press, but rest upon the circular plate *J*, which is fitted tightly into a hole bored in the base, and which in turn rests upon a substantial annular nut threaded into the bore. This plate is held against turning around by two large, square-sectioned keys *K*, located upon opposite sides of the center. The purpose of this construction is to provide a means of elevating the punches to restore their upper surfaces, or cutting edges, to the original plane after they have been reground. The force of the blow of the press thus falls directly upon the threaded adjusting ring, which is provided with a means of clamping to prevent it from receding under the continual jar of the tools. The stripper may be seen at *L*, with the six pins that extend through the supporting plate *J*, and rest upon the corresponding pins in the bed of the press, and which in turn rest upon the spring below. The annular ring *M*, in which the stripper is here shown standing, is fastened by flush-head screws to the base of the sub-press above the shoulder on the periphery of the stripper, after the latter is in place. It thus constitutes the limit stop that prevents the stripper from rising above the normal level of the punches. It is very essential that this level be preserved throughout the life of the tools. Several light coil-springs, one of which may be seen in Fig. 5, are placed between the stripper and the supporting plate. The sole duty of these springs is to support the stripper while the sub-press is being assembled and while it is being put into the

The second and concluding article.

press. Without them the stripper would fall of its own weight when the tools were out of the press, and the supporting pins, protruding below the under surface, would make an unnecessarily awkward and troublesome job of sliding the sub-press from the truck to the press bed. The upper surface of the stripper is subject to wear from the constant abrasion of the strip of steel passing over it. This wear is a factor to be considered in the construction of a tool, the product of which is to be enumerated in billions, therefore the stripper is made with a replaceable facing of B. & S. ground-stock $\frac{1}{8}$ in. in thickness, secured by small tapered pins riveted over below. The housing *N* is doweled to the base *I*, and is secured by four large fillester-head screws let into counterbores in the base from below. The bore of the housing has a slight taper, and is lined with hard babbitt to provide the wearing surface for the plunger. Four half-round splineways (there are to be eight in the newer tools) are milled in the body of the plunger *O*, and, since the babbitt lining is poured in place with the plunger secured in its proper relation to the housing, these splineways are filled with babbitt feathers cast integral with the lining. A helical groove in the body of the plunger serves to distribute oil and keep the plunger lubricated.

The upper end of the babbitt lining is covered by the annular nut *P*, the purpose of which is to force the lining further into its tapered seat, and thus close it in on the plunger as wear takes place. Such an adjustment is made each time the sub-press is fitted with new dies and punches—that is, after it has produced eighteen or twenty million blades—and even then the limit to which the lining can be squeezed amounts to no more than about one-quarter turn of the annular nut on its 16-pitch thread.

Referring to Fig. 4 (in the preceding article), which shows a sub-press assembled, it will be seen that four threaded studs in the flange of the housing pass through corresponding holes in the flange of the plunger, the upward movement of which is thus positively limited by the four pinion nuts screwed upon the studs, while its downward movement is resisted by the coil springs surrounding the studs. The pinion nuts mesh with a larger annular gear that turns freely upon a projecting shoulder above the flange and which serves to turn all of the nuts at once.

A fifth pinion, in front, also meshes with the annular gear and is the medium through which a wrench is applied, the bore being hexagonal in shape. When reassembling a sub-press after the dies and punches have been ground, it is necessary to bring a marked tooth of each pinion into mesh with a correspondingly marked tooth of the annular gear, after which adjustment of the plunger may be made without fear of cramping it. A check nut on the shoulder of the fifth pinion clamps it to the flange, and thus secures all of the adjusting nuts at once by preventing the annular gear from turning.

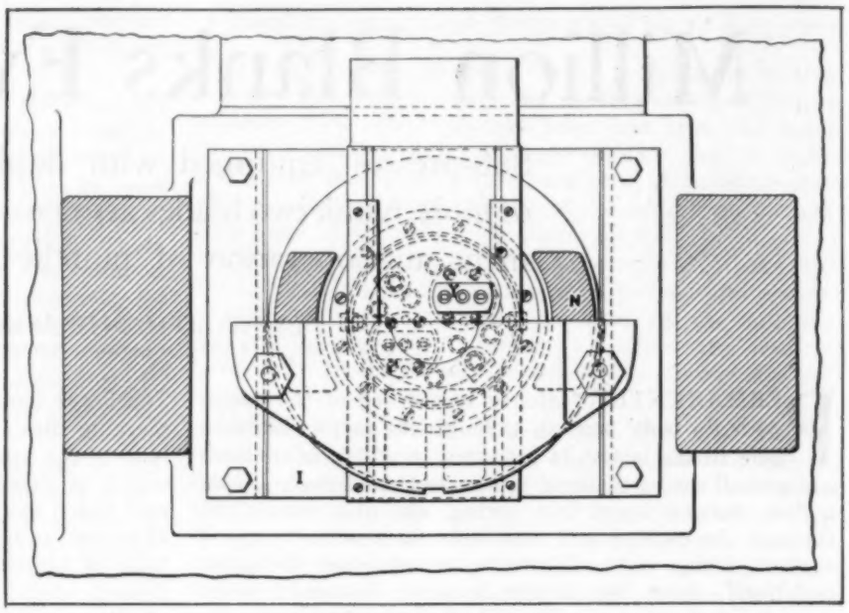


Fig. 6—Plan of tools

The plunger is adjusted in the toolroom at the time of assembling by placing a feeler gage between the tools. A movement of but 0.010 in. is allowed; being sufficient to cut the 0.006-in. stock but not to permit two thicknesses of stock to become superimposed in the tools. The stock cuts quite crisply, and were it not for the fact that it is necessary to push the piercings from the small holes into the piercing dies far enough to prevent them from jumping out and causing trouble in the tools, the work would be done by bringing the dies and punches "line and line." However, to insure against the above trouble it has been found desirable to enter the punches about 0.003 in. in the dies.

As in all compound tools, the blank is pushed back into the opening from whence it was cut by a spring-actuated shedder working within the die, and comes out of the tools in the strip of scrap. The location of the shedder and the manner in which it works may be studied in Fig. 5, the sectional view of an assembled sub-press. It will be understood that though but one set of tools appears upon the drawings, there are actually two complete sets in each sub-press.

The outline of the blanking die may be seen at *S*, where it sets into a recess counterbored in the lower end of the plunger. Its location in the recess is determined by the fit of the round shoulder and by two substantial dowels. It is retained therein by a ring attached by screws to the lower end of the plunger.

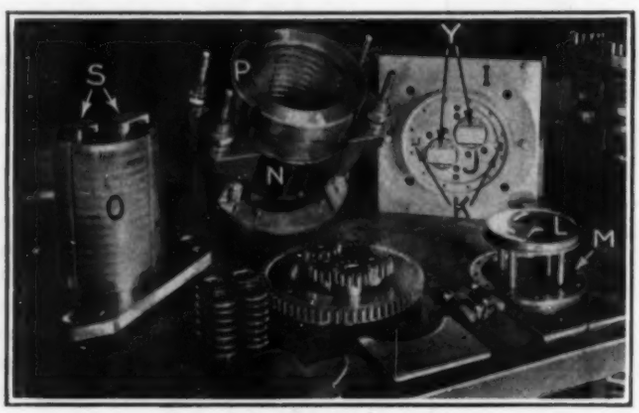


Fig. 7—A sub-press disassembled

The shedder *T* is as accurately fitted to the die as is the blanking punch. It is made with a round flange to bear upon two pins *VV* extending through holes in the body of the plunger to abut against a steel disk, *W*, which in turn is backed up by a coil spring working within a cell at the upper end of the plunger. The shedder is thus free to recede against the action of the spring when a blank enters the die, the reaction of the spring pushing the blank back into the stock when the die rises from the punch.

In the shedder there are three clearance holes for the piercing punches *X* (but one can be seen in the drawing) which pierce one round and two oblong small holes in the blank. Though the holes in the shedder are primarily for clearance, they serve as guides for the slender piercing punches, and are as accurately fitted as are the actual cutting dies. The dies corresponding to the piercing punches are bushed holes in the blanking punch *Y*, located on the base of the sub-press.

The piercing punches are made separately, but are shouldered into a disk *Z* secured at the bottom of a smaller recess counterbored concentrically with the larger one in which the die is held. They are driven tightly into this disk and further secured against being pulled out by small screws put into them from the back of the disk. These screws do not show in the drawing, nor do the screws by which the disk is anchored in the recess. The pins *VV* slide freely through holes in the disk.

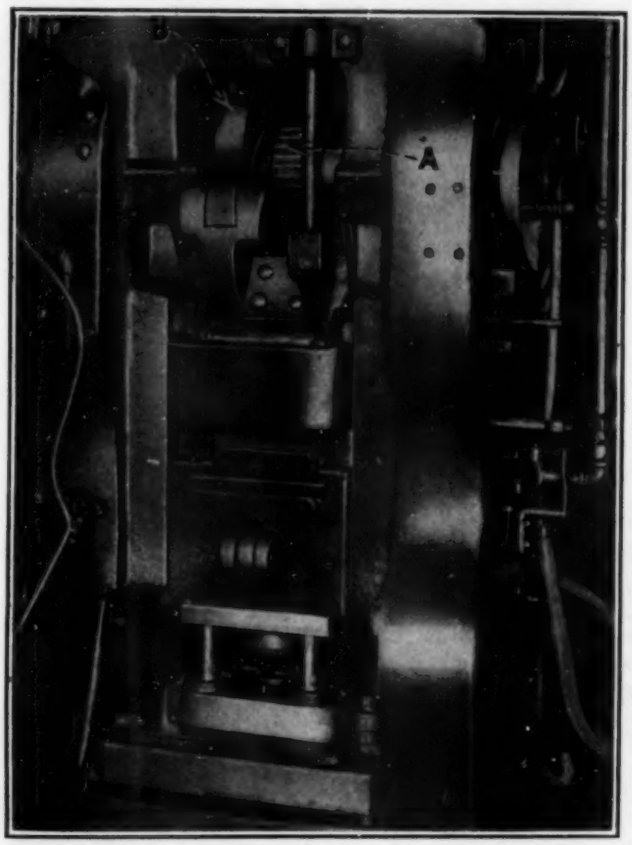
Press That Permits Accurate Shaving of Thick Material

By Louis L. Locke

WHEN a metal stamping or blank approximately ⅛ in. in thickness requires an accurate contour, the usual practice is to shave the edges in two operations, removing approximately twice as much metal in the first shave as that removed in the second. When the blank reaches 1/16 in. or more in thickness, however, it is seldom possible to obtain an entirely smooth edge because the last section of the finishing cut has a tendency to break off, thus leaving a ragged edge on one side. To overcome such a condition, the National Cash Register Co., Dayton, Ohio, is using the vibrating-type shaving press illustrated.

The press is used for parts that are more than ⅛ in. in thickness, and on which only one shave is made. In this plant it is termed a "jigger" press because it shaves the part in steps. On the crank of the press are mounted two cams that operate the vertical movement of the ram. The face of the cam *A*, made with a series of humps on it, bears against rollers attached to the ram. As the cam rotates, it causes the ram to descend with a vibrating movement so that the die shaves the work in steps. Cam *B* returns the ram to its original position. The cutting action obtained affords a smooth shave, eliminating the torn or broken edge on the bottom side of the work.

The use of the press makes possible the shaving of parts in one operation that heretofore required two or more shaves, with the advantage of producing a better finish.



Vibrating-type press for shaving thick parts

"—eight—nine—TEN—and Out"

FOR a long time the *American Machinist* has been carrying on a campaign to get rid of obsolete shop equipment, pointing out that modern and up-to-date machines, tools and other shop equipment are essential to production at costs that will permit selling in today's highly competitive markets.

Related efforts have come to our attention from time to time. A forceful presentation of the problem, recently issued by a machinery dealer, was sent to us by a machine tool builder who was favorably impressed.

The presentation was in the form of a circular artistically printed in two colors. The heading was "—eight—nine—TEN—and Out" followed by this text: "You don't notice how the years fly by. Just consider —1917, that eventful year—ten years have passed since then.

"Ten years—it may be a speck in eternity—but it is a pretty good chunk of man's life—and just about all there is to the life of a machine tool.

"Just compare the machine tools of ten years ago with the ones of today. The modern machine tool has speed that cuts off costly seconds. Extra power permits heavier feeds. Increased accuracy cuts waste. Ease of control saves operators' steps. Anti-friction bearings save power. Modern machine tools are keyed up to the present day tempo. They are fit for the razor-edge competition of today.

"The ten year old machine tools in your shop can't fight back against the advantages of this younger and better generation. And it is an expensive losing battle to let them try."

Elements of an Industrial Relations Program

"WHAT are the minimum elements of a decent, practical and efficient policy of industrial relations, including the underlying physical facilities for a fairly successful, moderately sized industrial plant in America today?" This is the question that was asked of some leading business executives by the Policyholders' Service Bureau of the Metropolitan Life Insurance Co. Two of the replies were printed in the *Executives Service Bulletin* published by this department of the company.

According to L. F. Loree, president of the Delaware & Hudson Co., in answer to the question, a man should be examined as to his fitness for the work that he is to do and be informed as to what kind of work will be required of him, at the time of his employment. He should also be informed what the chances are for his instruction and promotion, and what wages can be earned.

The employee should be paid wages sufficient to enable him to live in comfort and in conformity with others engaged in similar work in the community, to educate his family, to provide for old age or disability, and to provide for an increased earning by initiative, skill and application. There should be provided a method by which an employee may protect himself against the majority of the hazards of life.

In every company there should be management which will assure continuity of employment, prompt hearing of complaints, unbiased decisions, explanation of the action or decision in cases of discipline, opportunities for training and promotion, and the exclusion of favoritism. There should be proper quarters and furnishings for work, meals, recreation, bathing, changing clothes, etc. An important factor in employee relations is provision for education and recreational occupation during free time.

In answer to the same question, Henry S. Dennison, president of the Dennison Manufacturing Co., advises lighting, sanitation and safety equipment as good as shown by experiment to yield the greatest efficiency over a long period; in any case, no lower than the legal requirements.

Measures should be adopted to insure the placing of workers in work physically appropriate to them. These measures involve some degree of job analysis and some physical examination as well as some study of special fatigues. Practical clinical arrangements are needed. They can be maintained either by the concern itself, in co-operation with the community, or with other concerns. Lunch room facilities should also be provided.

The concern should adopt appropriate measures for training, worked out to suit the needs, not merely allowed to grow. Mental contact with the company's affairs through bulletin boards or a small plant paper should be fostered. All reasonable facilities for employee self-education, in co-operation with local libraries or schools are needed.

Applicants for jobs should be received in a decent room and should receive courteous treatment at all stages of the business cycle. When you hire a man and have him properly placed give him a proper introduction to the foreman and to his fellow workers. Give him a starting wage appropriate to the local situation and promptly follow it up. If the man is a misfit he should be transferred to work more suited to him. All discharging should be supervised so that the grounds for discharge may be consistent throughout the plant and shall be reasonable. There should be appropriate measures for appeal so that the individual workers shall not be without recourse in case of unfairness or supposed unfairness.

Other elements needed to promote good industrial relations include the assistance of the plant in the establishment of such aids as sickness insurance, life insurance, unemployment insurance, savings funds, the credit union, housing funds, pensions, accident compensation, etc.; raises and promotions established on merit and given when deserved; foreman training; promotion of courtesy; establishment of some proper suggestion system; and continual improvement in the ability of the management so that it will be able to keep up with the advancing ability of the shop.

Grinding Blades of Hand Saws

By James Denton

THE grinding of handsaw blades, a job for which natural stones have long been considered the only satisfactory medium, is now regularly accomplished with wheels of artificial abrasive used upon standard grinding machines. The illustration shows four such blades held by a Taft-Peirce magnetic chuck on a Norton, type G, open-side machine.

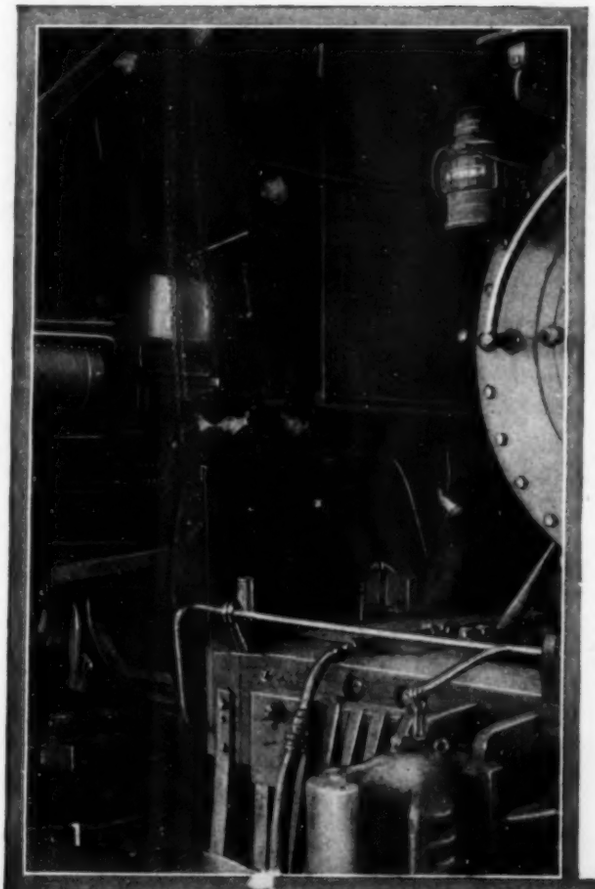
The difficulties in the way of grinding hardened steel of thin section are two-fold: there is always the danger of drawing the temper, and trouble is often experienced from the curling of the stock because of the removal of

How handsaw blades are ground

the scale and consequent release of surface strains to an unequal degree. These difficulties have been overcome by experimentation; largely through the use of free-cutting wheels which generate but little heat, and by frequently turning the pieces to equalize the release of strains.

When the blades come to this operation, from 0.003 to 0.005 in. only is to be removed from each side. The work is done with a wide-faced Alundum wheel of 1924 grit, grade I, vitrified bond, running at a peripheral speed of approximately 3,000 ft. per min. The table traverse is 80 ft. per min. Ample provision is made for flooding the work and wheel with water and thus prevent undue heating.

Four blades are ground at once, and the production is at the rate of 25 blades per hr., ground on both sides.

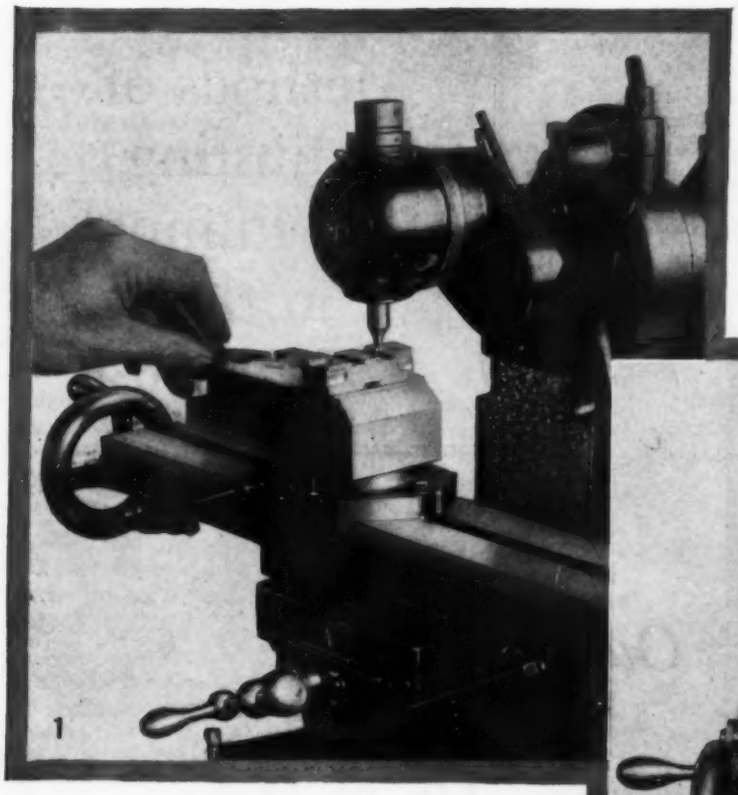


Methods of Adjusting Air Pumps in the Roundhouse

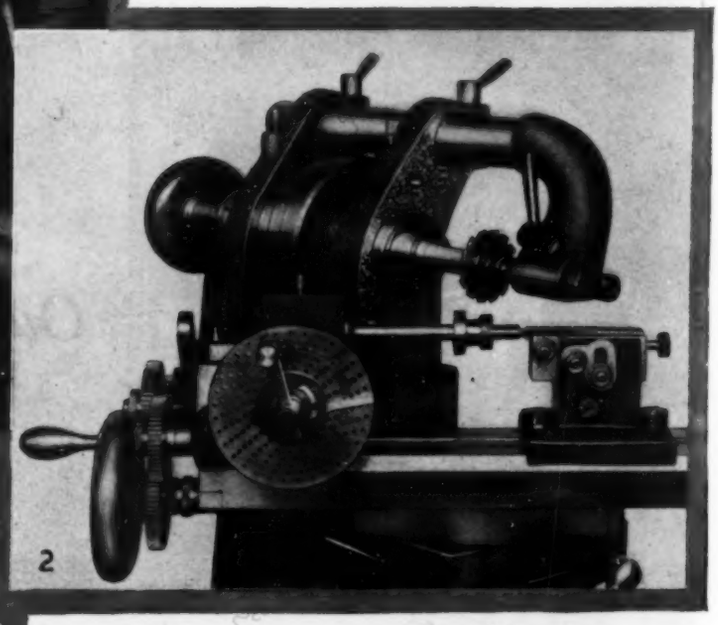
Photographs by courtesy of the
Denver & Rio Grande Western R.R.
Salt Lake City Shops

Out-of-Date and Up-to-Date

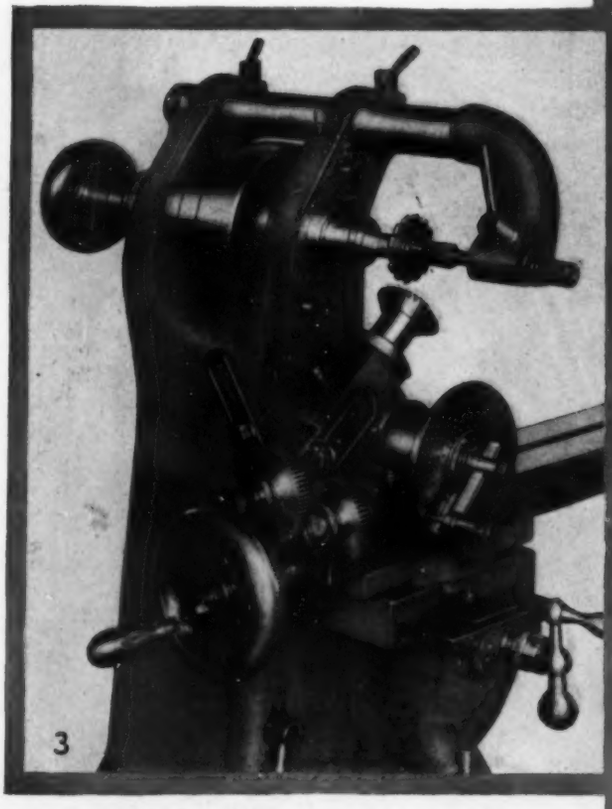
Odd Jobs on a Hand Miller



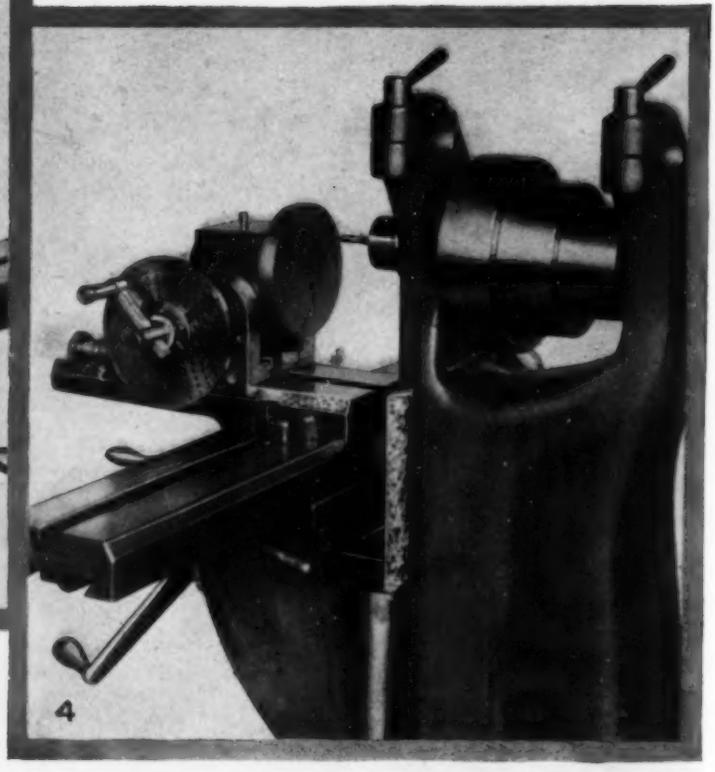
1—Vertical spindle attachment cutting dovetails



2—Cutting a spiral gear



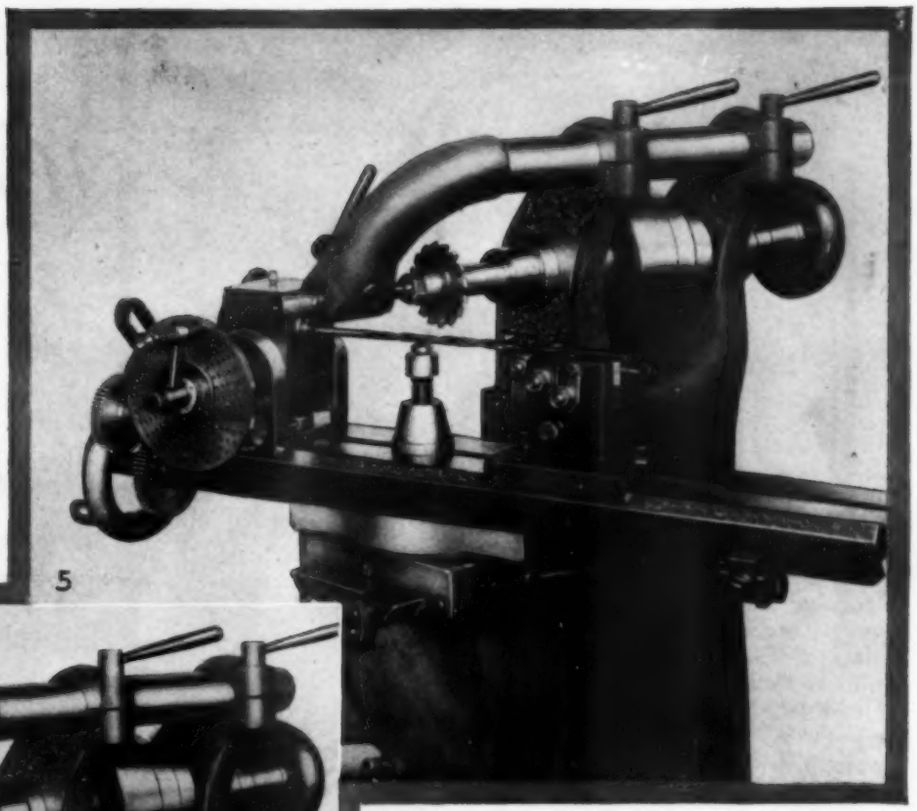
3—Bevel gear cutting

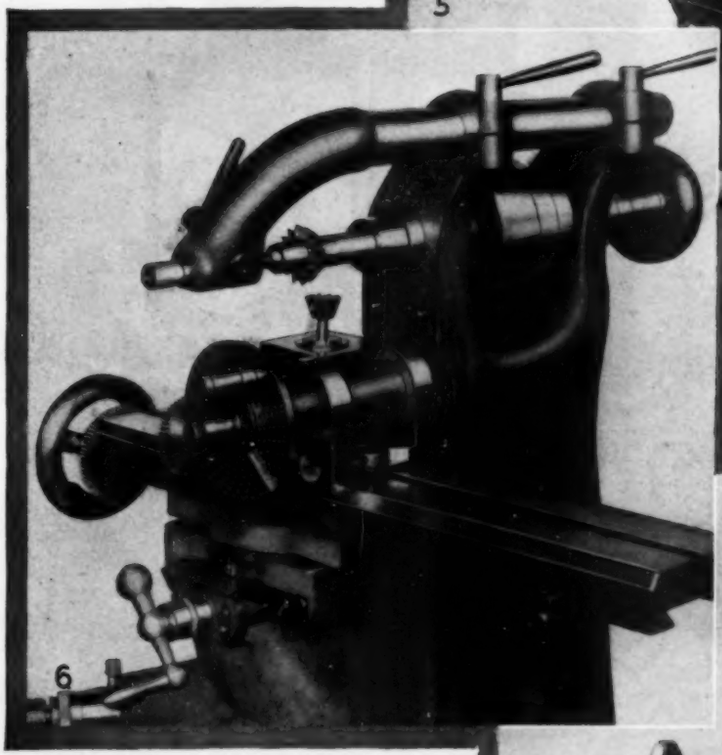


4—Laying out a drill jig plate

5—Spiral milling a twist drill

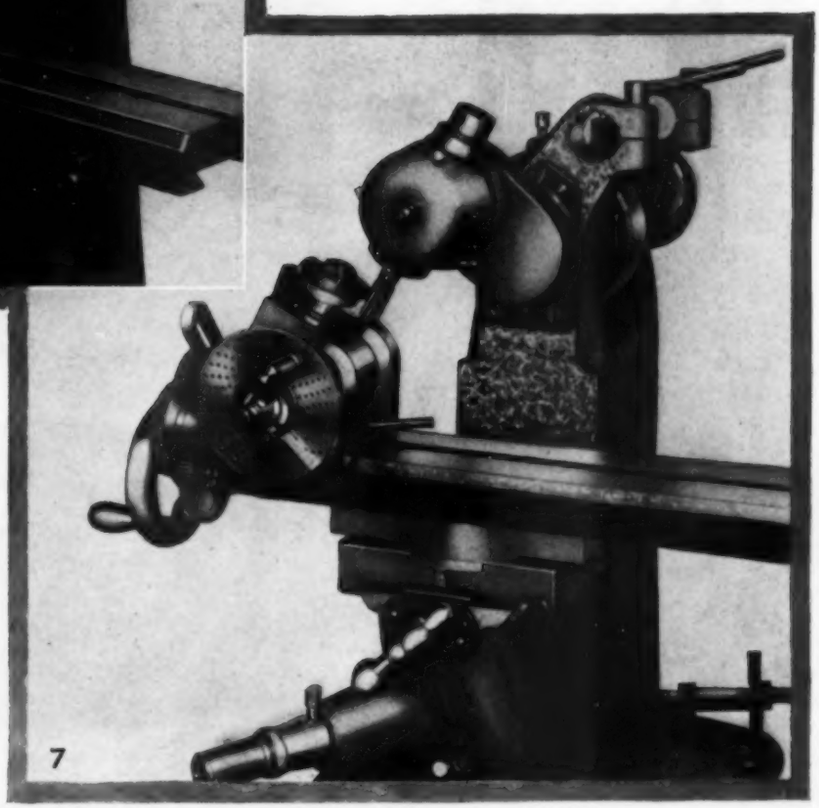
Photographs by courtesy of the Pratt & Whitney Co., Hartford, Conn.

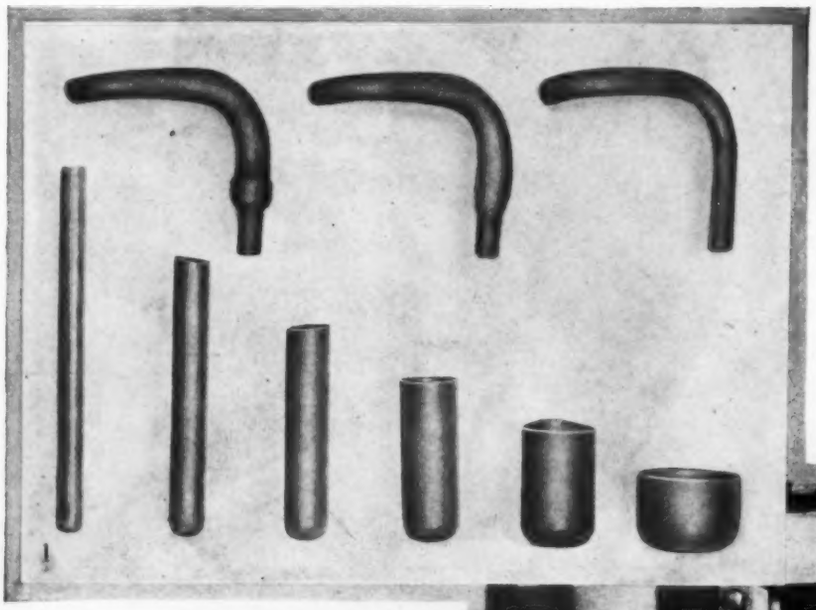




6—Making a milling cutter

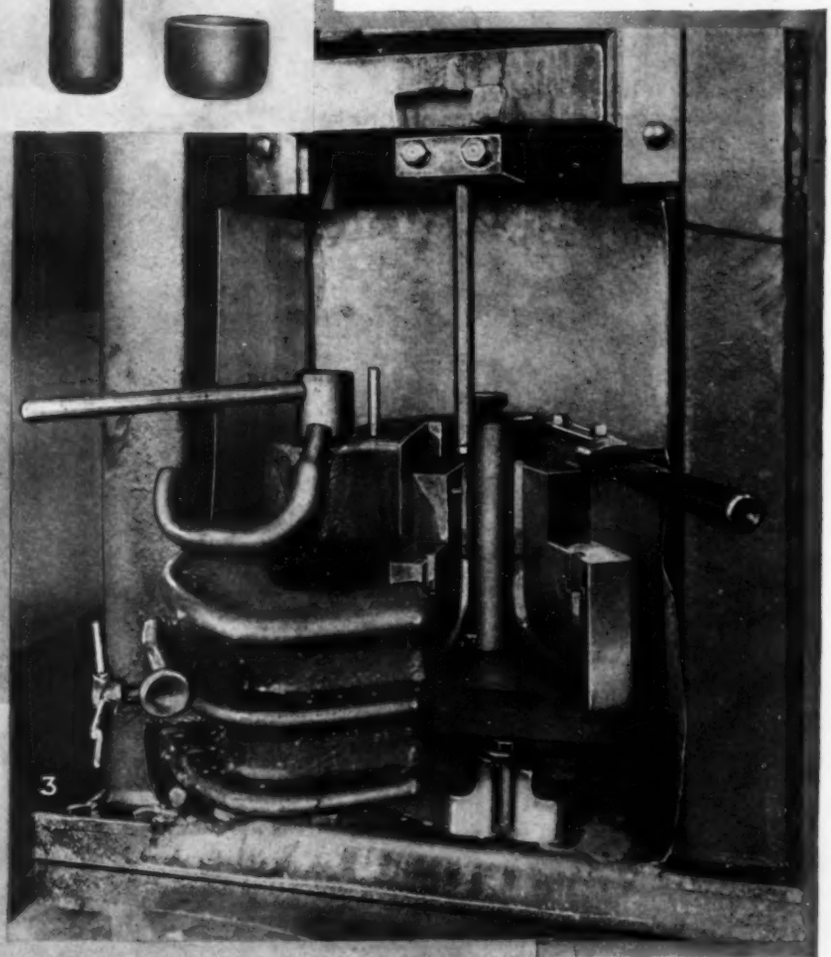
7—Cutting a screw machine cam





Water-Pressure FORMING

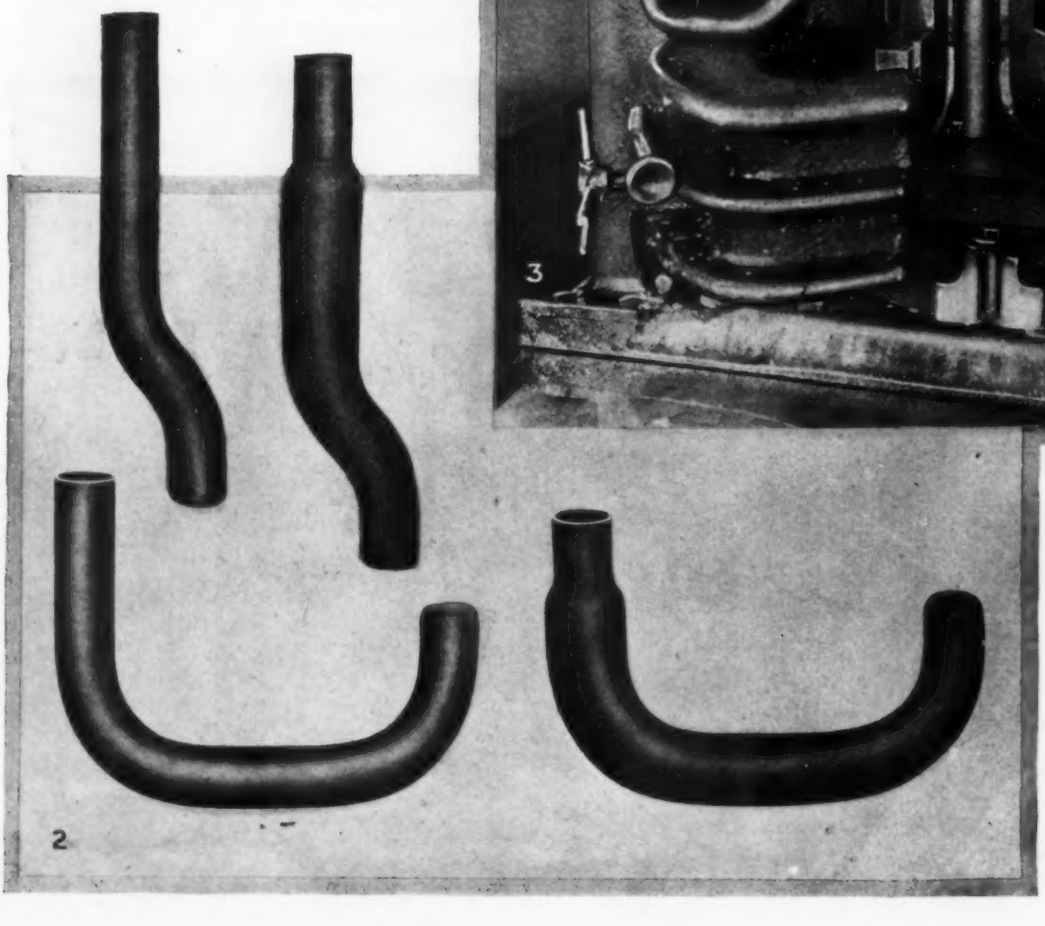
Photographs by courtesy of the Victor Talking Machine Co.



1—Tone arms are expanded from drawn tubes. They are filled with water and then locked in a die. A tight-fitting plunger in the press forces the walls to fill the die

2—Bulging and tapering is done in a similar manner

3—Tools in press for expanding, bulging and tapering tubes



Good Lighting Means Safety

By M. LUCKIESH and FRANK MOSS
Lighting Research Laboratory, National Lamp Works of the General Electric Co.

Good lighting is a safeguard to workers—Accident records shown as related to daylight intensity—Bad effects of partially blinding conditions

A WELL lighted factory or machine conveys at once the impression of orderliness and safety. This impression of safety is sustained in fact. A number of large manufacturers claim that by lighting their factories in accordance with the best modern practice, accidents are reduced from 50 to 75 per cent. However, good lighting has not been widely utilized to promote safety, as is evident from statistics showing numerous accidents as directly attributable to poor lighting.

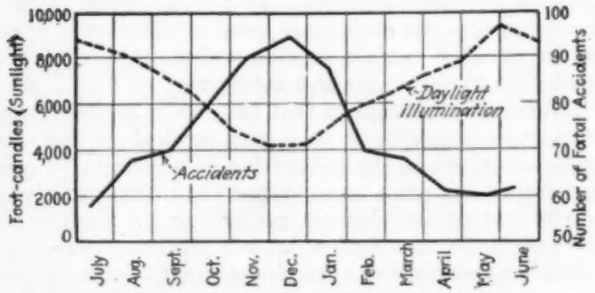


Fig. 1—Diagram showing relation between light intensity and accidents

The influence of lighting upon safety should be obvious when thought is given to the subject but, unfortunately, the great difference between "mere lighting" and "good lighting" is not generally considered. As it is necessary to illuminate all work places sufficiently to enable the work to be done, the difference in cost between poor lighting and good lighting must be compared with the enormous loss to industry resulting from poor lighting. Economically the prevalent condition of inadequate and improper lighting is unjustifiable because the value of accident prevention alone would more than pay for the proper lighting of all our places of work. Industrial accidents cost the United States about two billion dollars annually. Twenty per cent of this loss is directly or indirectly the result of inadequate lighting.

Numerous safety devices have been applied in the industries to protect workers at the various danger points. This practice has been so successful that many of the safety appliances developed have been made compulsory by law. Good lighting is just as real and as effective in safe-guarding workers as many other devices such as, for example, a guard around revolving gears. It is a "safety device" which can be applied to all work places and to all types of machines. Proper lighting is a safe-guard which automatically protects without requiring the worker to make an effort to use it since seeing, like breathing, is natural and instinctive. Furthermore, good lighting performs other valuable functions not commonly associated with safety devices.

When a representative group of industrial executives were asked to express an opinion on the value of good lighting to industry, sixty per cent of them justified the cost of a modern lighting system on a basis of increased safety. However, it is not necessary to rely only upon opinion in evaluating the effect of lighting in the reduction of the number of accidents. Fig. 1 shows the accident rate plotted for each month of the year and also the average intensity of daylight illumination throughout the year. It is apparent that a change in the intensity of natural light results in a change in the accident rate and the very close relation between them indicates the powerful influence of light upon the accident rate.

If good artificial lighting were available so that a proper standard of lighting could be maintained when daylight was inadequate, the variation in the accident

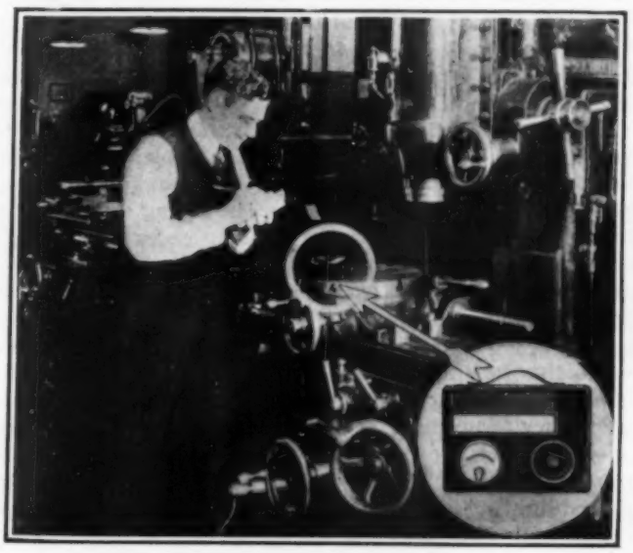


Fig. 2—The portable foot-candle meter

Fig. 3—An example of glaring light

rate would be greatly reduced. The chart expresses the possibilities of accident prevention in a very conservative manner because it is based only upon changes in intensity of illumination. If the distribution of the light could have been precisely fitted to the needs of the individual places of work, a further improvement in safety would have been obtained. Experience in lighting has shown that the factor of light distribution is often as important and sometimes more important than the factor of intensity of illumination.

High Function of Sight

Authorities state that approximately 70 per cent of our muscular activities are a result of stimulation received through the sensation of sight. It is important, therefore, that the visual impressions so necessary for the continuation of activity should be clearly, accurately and quickly formed. The influence of good lighting on these fundamental requirements of vision has been made the subject of detailed study and definite conclusions have been obtained. For the purpose of showing the effect of good lighting on safety in the industries, the subject can be broadly divided into three parts: the accuracy of the visual impressions, the speed of the vision, and the ability to sustain accurate and quick seeing. The intensity of illumination can be measured readily, so that a definite study of the amount of illumination in each particular spot can be made. The small portable "foot-candle" meter shown in the insert in Fig. 2 can be used by anyone in making a survey of illumination intensity. By comparing these measurements with the approved lighting codes some of the faults of poor lighting are readily revealed.

Inaccuracy in the performance of certain tasks is responsible for many and various types of accidents. If a place of work is poorly lighted, there is introduced into the work an uncertainty of performance, since the work is not clearly seen. Indifferent seeing thus has a tendency to promote carelessness in certain parts of the job and such a condition is very apt to spread so as to make the work of the entire day careless and inaccurate. Good lighting operates in two ways to promote accuracy. It is equipment that enables the worker to do originally better work and also makes errors more obvious and consequently less excusable. The accompanying table illustrates, in a brief way, the relative improvement obtained in several important phases of vision when the intensity of illumination was raised from one to twenty foot-candles. By extension, such data are very suggestive of the relation of lighting, vision and safety.

Another type of accident results from the failure of a workman to act quickly enough to prevent injury to himself or to equipment. Action cannot take place until the worker has received a clear picture and understanding of the situation. Quick seeing, therefore, is desirable. The improvement in speed of vision obtained by the use of higher intensities of illumination is indicated by item 4 in the table. The real significance of the increase in speed of vision, so far as safety is concerned, is that the additional speed of vision may mean, in the case of rapidly moving objects, the difference between actually seeing and not seeing.

The Result of Increasing Illumination Intensity

Factors in Vision	Relative Improvement 1 ft.-candle	20 ft.-candles
1. Visual acuity, or sharpness of vision	100	155
2. Discrimination of brightness-difference by means of which objects are seen	100	170
3. Error in performing visually controlled work	100	83
4. Speed of vision, determined from speed of reading tests	100	140

Experience has taught that fatigue is a direct cause of numerous accidents and any method of reducing fatigue will aid in the prevention of accidents. Proper lighting of the place of work has been demonstrated to be effective in reducing fatigue among the workers and its benefit is manifested in two different fields. It reduces eye-strain and eye-fatigue to a minimum thereby promoting the general welfare and well-being of the worker. Good lighting also makes the accomplishment of work easier by reason of quick, clear and sharp visual impressions. Hence, the worker can accomplish the same tasks in less time and the time thus saved can be utilized to further advantage to pay the lighting costs.

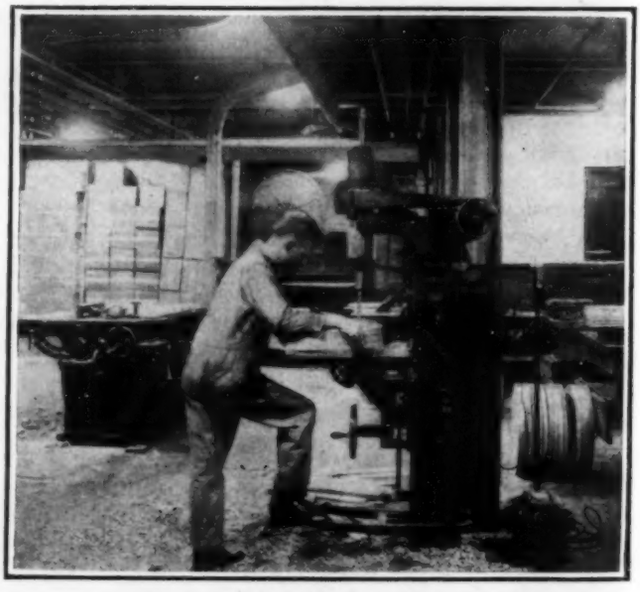


Fig. 4—The rehabilitated shop

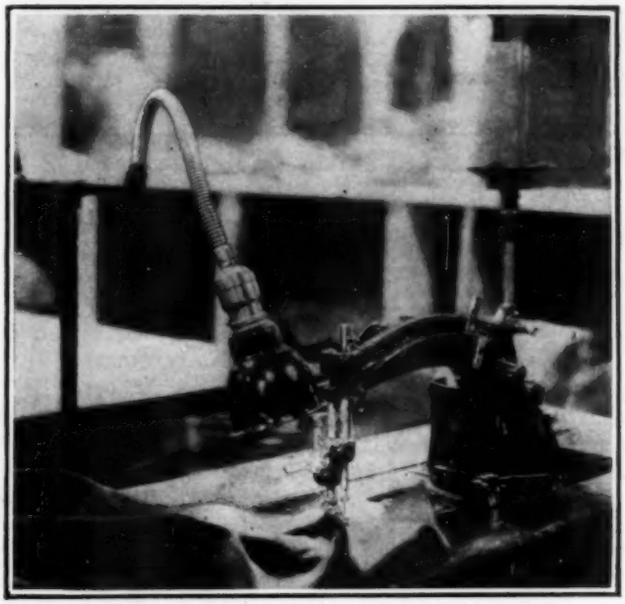


Fig. 5—An example of special local lighting

An abundance of light, if improperly placed, is a handicap to clear and quick seeing. Glaring light-sources, such as bare lamps placed too close to the line of sight, produce a partial or temporary blindness. Such a condition of lighting represents a potential accident hazard to the workers thus handicapped with reduced vision. Fig. 3 shows an example of a worker being handicapped by the use of a glaring light in his field of vision. This lighting system was rehabilitated as shown in Fig. 4, where the shop is well lighted. There is a fairly even and uniform distribution of illumination and an absence of harsh shadows and glaring lights. Fig. 5 shows the typical method of handling special local lighting for jobs requiring the quick seeing of fine details.

Glare may be divided into three classes: veiling glare, dazzle glare, and blinding glare. Veiling glare obscures details through a veil of light spreading or seeming to spread from a brilliant light source near the line of vision or, more rarely, by diffused light in smoky, foggy or dusty air. Dazzle glare is uncomfortable, distracting, and reduces the ability to see. This is the most common type of glare. Blinding glare is due to extreme brightness that greatly reduces, for a time, the ability of the eye to see.

Although glare is thought of as being the result of brilliant light sources, the effectiveness of vision may be greatly reduced by other forms of poor lighting. If the eyes are required to work in and out of fields of excessive contrast, the constant changing of adaptation is not only fatiguing, but also a time-wasting process, and the result cannot be other than undesirable. This condition is met with for example, when the eyes must look from a bright surface into deep shadows and vice versa. Besides this objection to deep shadows, it is obvious that dangers to the worker may actually be lurking in them.

Industrial lighting when analyzed as a safety measure, has a much broader application than just the prevention of accidents. It also assists in the conservation of eyesight and has a wholesome effect in conserving the health and in improving the morale of the workers. These fields are difficult to appraise in dollars, but they are valuable to industry. The Eyesight Conservation Council has completed a survey of 170 companies located in twenty-three states and employing over a million persons. In this group about 140,000 employees were given eye tests and the tests showed that a grand average of 54 per cent of all workers had defective vision. This percentage varied from 48 to 71 per cent for the various groups examined. It has been conservatively estimated that at least 50 per cent of the population have defective vision. Poor lighting through the eye strain and fatigue that it produces, has been indicted for much of this widespread prevalency of defective vision and its resulting lowering of productiveness.

A lighting system that will give the most aid to the eyes in obtaining and sustaining clear and quick seeing will provide the safest working conditions. The following are pertinent questions which shop executives should ask themselves:

1. Has an adequate intensity of illumination been provided which considers
   (a) the size of details or objects to be seen,
   (b) the speed at which they must be clearly seen, and
   (c) their contrast amid their surroundings or against their backgrounds?
2. Is the distribution of the light such that the best visual conditions are obtained, considering
   (a) the use of light and shade to emphasize detail and to aid vision,
   (b) the elimination of the several types of glare, and
   (c) the avoidance of both very bright and very dark areas within the visual field?

While it has not been possible in this discussion to give a detailed analysis of good lighting practice, the essential features of such lighting are the ones that have been emphasized.

The Problem of the Egotistic Worker

By M. M. Balsam

AS OWNER of a small shop, I have time and again through many years of experience studied the various types and characteristics of men that I have employed. Invariably, when seeking the job, they avow an earnest sincerity which becomes only a sham after hiring them and seems to shatter whatever faith I would like to have in the workingman. If they are not watched they ultimately lay down on the work.

After much pondering on a solution to this state of affairs, I ventured into seeking a more trustworthy man by the much talked of co-operative plan. In fact I was willing to go one better. Realizing that I could use a man to share the interests and good will of the shop, providing said employee proved himself capable and honest I several times explained this to the man I hired, promising him a share in the business if he should prove his worth. In almost every case when I tried this plan the man became skeptical in less than a week and began the old game of trying to fool the boss and when told to go appeared surprised, as if he did not deserve it. Others, more spunky, confessed to me that their reason for laying down on the work was that my proposition appeared too good to be true, which made them think there were some strings attached to it.

As I review my experiences in regard to the psychology of the workingman I know much less than ever before. Friends in the field, to whom I have outlined the above, tell me that had I sought a man with capital, I should have obtained plenty of capable ones, willing to sacrifice time and so on without a whimper.

THE · FOREMAN'S · ROUND · TABLE

Advantages of Foremen's Clubs

The following narrative is a "case" presentation of the topic. It has been written to involve some of the questions that arise in the average shop. For guidance in preparing discussion the questions at the foot of the page have been prepared

"HOW do you feel about joining the new Foremen's Club, Al?" 'Twas Ed, who seems to look to Al for a lead in many matters.

"Guess I'll join, Ed. Looks like it ought to be a good thing for all hands."

"I dunno, Al. I'm not much of a hand for clubs."

"Neither am I, Ed. I'm no 'joiner,' either. But here's something that is right in line with our own bread and butter. We ought to get a lot of ideas from the other foremen in town."

"But they don't know our troubles, Al. They have different kinds of work."

"Sure they do. But foremanship problems are very much the same, no matter what the shop does. Men are much the same whether they build machinery or work in an ice cream plant. They have similar hunches that the boss isn't playing fair, and the same sort of a grouch after a breakfast of cold pancakes."

"But, Al, how can a bunch of foremen from different shops get together and not give away a lot of shop secrets?"

"Such as what, Ed?"

"Oh, how we handle work in the shop, the sort of tools we use and so on."

"Ed, you're nutty. There isn't a shop in town that hesitates at letting us go through the place just as we welcome the other fellows here. This shop secret stuff is ninety-nine per cent bunk. I generally find that the things a fellow thinks are secrets have been discarded by the more progressive shops.

"I believe, Ed, we'll both learn a lot by mixing with the other foremen in town. It would be nice to think that we had all the brains locked up in this shop, but we know a darn sight better. Just knowing the other fellow often helps a lot. They may be able to recommend a good man once in a while if their shop is slack—and we might do the same. You are more apt to do things like that if you know the other chap personally. This interchanging of ideas is all to the good, Ed—and I'm for it."

Does Al have the right slant about Foremen's Clubs?
Or is Ed right as to giving up too much information to the other fellow?
Is there a Foremen's Club in your city and how does it work out?

All foremen are urged to discuss these questions. Acceptable letters will be paid for. The discussion is not limited to foremen, of course

Discussion of Earlier Topics

Taking Care of the Old Men

THE man at forty in academical, clerical, and legal circles is still a young man. The statesman of forty is but a youth. The worker in an engineering concern is far from being a spent force, once he has turned his back upon the forties. Some of these "ancients" surprise the young bloods by reason of their sheer pride in craftsmanship and quality of work turned out.

If speed of working suffers a little by comparison, the results do not seem to lag behind. The old ones stick it better, and their powers of concentration and endurance are more in evidence. Moreover, their mental attitude is a big asset to their employers. They breathe out an atmosphere of contentment and well being, which cannot be reckoned in terms of cash. Consequently, to keep such men as these in employment is no act of philanthropy. It is common justice, and sound business. They are the have-beens, true, but when they keep fit and smiling they put many a youngster to shame. As to whether they should be separated from their younger associates will depend largely upon circumstances. It is generally inexpedient to make a hard and fast rule in cases of this kind. Some may be retained to give ballast to the team spirit of work and responsibility. For non-rush work, of course, the majority of the elders might well be banded together in a non-production group. But where the older men retain grip and keep abreast of the times, they often make splendid material for executive positions. Several of the best and most capable foremen that I have met have been on the ripe side of fifty.

—W. R. NEEDHAM, *England.*

Who Should Do the Discharging?

EVERY foreman should have final authority in discharging as well as in all other personnel problems in so far as his own department is concerned. This is an essential of good formanship.

However, the workman who is a misfit in one department may be just the man for another, because no one department can provide the most suitable and congenial type of work for every degree of skill and temperament, and no one foreman can be a kindred spirit to all the personalities with whom he has to deal. So, for the benefit of the workman, who can not possibly show to his best advantage on work for which he is not adapted or in which he is not interested, and for the benefit of the company, which can ill afford to put up with either half-hearted workmen or high labor-turnover, there should be some medium through which the labor needs and surplus man-power can be brought together.

Foremen do not ordinarily have sufficient time nor sufficient breadth of viewpoint to treat such matters adequately, while a properly officered personnel department has. Without appropriating any of the foremen's prerogatives it can keep it's finger on the pulse of the entire plant and go far toward co-ordinating the plant.

—W. C. LANDIS.

Which Kind of a Man Is More Valuable?

IF WE ever attain the industrial millennium where no one in the organization from the president down to the humblest helper makes mistakes, I will be all for the man who accepts orders and fills them without question. Under such circumstances he would certainly be the ideal employee no matter what his capacity. But, after recently hearing the chief executive of a large manufacturing organization state that if no one in his organization including himself, made mistakes, he could operate on a four-day week and maintain his present profits, I am brought forcibly face to face with the situation that such an ideal organization at the present stage of industrial development is a dream, and I have a strong suspicion it will be ever thus. So, granting the capacity of the human machine to make mistakes, I'll have to cast my vote for the kind of a man who asks questions and points out the little things about his job, whatever they may be. He's giving his company "results," while the other fellow is merely offering "alibies." "Results" count for every one in the organization, "alibies" at best only for the artist. Continued results boost a man up the ladder of success, continued alibies boost him off. You can rest assured that the man who questions is giving everything he has to the job, while the fellow who just follows orders is only giving enough of his mind to get him by. An organization is only as successful as its component parts, and the employee who doesn't give a hang about the organization and acts only on behalf of himself is a handicap and not a help.

—W. F. MICHAEL.

THERE is no question as to which of the two men is the most valuable. The man who asks questions knows that an ounce of prevention is worth a pound of cure, and that seems to dominate him in his work. Of course, a little bit of common sense is necessary, in order to avoid bothering the foreman too often.

—SAMUEL KAUFFMAN.

I DO not fancy the nosey workman, as he has no confidence in his abilities. The man that goes about and attends to his business and works to the blueprint that his foreman gives him, and completes the job without

THE · NEXT · TOPIC

Getting Information From Salesmen

QUESTIONS

Is the good, modern sales engineer welcome in your shop?

Does he give you information of value on general practice?

Do you give him a chance to help out on your problems?

questioning or running all over the shop for instructions from his foreman, is the best man. The nosey man has no confidence in his abilities, and has to be questioning his foreman on any defective part of minor importance. —R. W. BLAIR, *Foreman.*

A MAN who is thoughtful, conscientious, and ambitious, doesn't get into a rut and stick there. He keeps clear of ruts made by others, and doesn't make them for himself. His desire for education prompts him to ask why about the things that are not clear, and his honesty of purpose will not allow him to proceed with anything that he doesn't understand. This kind of man is the more valuable for an employer, even though his mechanical skill may not be as great.

—JOHN MARK MAY.

THE type of man who hunts up the foreman is a nuisance. He is in most instances trying to curry favor with the boss. On the other hand it is the foreman's fault if he allows men of this type to waste his time on things too trivial to bother about. Unfortunately, some foremen cater to this type of man, and show that they like to see every little thing.

But when the foreman has a man of Jones' type to deal with, he has to be doubly careful, for if he gives the man a wrong instruction in an unguarded moment, the latter will carry on although he knows he is doing wrong, because of entire lack of interest in his job.

—ARTHUR SILVESTER.

Helping Your Men Get Better Jobs

A FOREMAN who helps one of his men to get a better job is going to score over his narrow-minded brother. First, he is setting an example of kindly good-fellowship that will gain for him the respect of all. Secondly, he is offering a double incentive to his men to give their best, the chance of promotion in their own plant, and the prospect of being recommended elsewhere. The loss of a good man is only temporary. It is axiomatic that the best shops attract the best workers, and a shop whose foremen are of the same generous nature as Al, has a good claim to come under this heading. —JAMES C. GILSTON, *Scotland.*

AL WAS right in getting Tom Jackson a better position. The majority of men are working to better their conditions. It will only be a short time when Al will have several of his men qualified to as as assistants. By his action they will feel, should their ability entitle them to promotion, that their efforts will meet with success. The result will be a more efficient department. It will put new life in his men, knowing promotion is not confined to the shop wherein they work.

—JOHN CLARK, *Gang Foreman.*

IF I HAD a good man working for me, one who had given the firm the best that was in him, and I heard of an opportunity for a better job for him in another shop I would not hesitate to tell him about it. Of course, I wouldn't either advise or urge him to take the job, but I would give him as fair an analysis as I possibly could of his prospects in staying with us, and then let him apply his own judgment. To let him make his own decision I regard as paramount, for many a job looks good when it is far away, and to advise a change which afterwards did not pan out, might only react as a boomerang upon the man and myself.

—B. E. LAMBERT.

Should Foremen Accept Presents From Their Men?

GEORGE is to be commended on his stand in the matter of taking presents from the men under him. Very often a man who refuses to contribute to this form of bribery is subject to the slurs of his fellow employees, although he has reasons for refusing to "chip in." The giving of even a small sum may be resented by the person who gets a set amount for his week's expenses. The man who pleases the management is the fellow who comes in on time, and keeps scrap down and production up. It is better to please the boss who pays off rather than give presents to the foreman who lays off. —SAMUEL KAUFFMAN.

FOREMEN should not accept presents from their men. Every shop should have a rule reading as follows: "No collections allowed except by mutual consent of the management and the men." If the loyalty of the workers has been gained, the employers will benefit by increased profits. Therefore, the men should not be allowed to spend a part of their earnings for presents to their superiors. —R. SENAY.

EVERY foreman should establish the understanding that he cannot accept gifts of any nature, nor for any reason, from his men. This can be done in such a manner as to give no offense to those concerned. The danger to a foreman or an employee just promoted when he accepts a gift from his men, lies in the fact that upon accepting he is placed in an obligatory relation with the donors. He cannot help but feel this obligation and this feeling is shared by his crew.

—H. K. FLECKNER, *Chief Draftsman.*

AL IS right in his attitude toward giving presents, but I don't believe he gives enough credit to the ability of his men to exercise good judgment. "You can't fool all of the people all of the time," and the man who isn't really liked will seldom get a present. A movement may be started, but it will be discouraged.

The foreman is under no obligation if he accepts a present from his men, and I believe he would be despised by his men if he gave any indication of feeling that way. That would be entirely contrary to the spirit in which the present was given.

I believe the men like to contribute as it is their way of showing admiration for the man for whom they work. In terms of the difference a real boss makes in their daily life, contrasted to a surly, grouchy, fault-finding man, it is just a small token of their appreciation. —J. H. CHEESEMAN.

PRESENTS and business do not mix. There may be exceptions, but the difficulty is that if presents are permitted for any cause, it is inevitable that some well-meaning friend or self seeker, will endeavor to extend the scope of present giving "just this once."

The only time when presents should be acceptable to the foreman, is when the gift is a pure expression of sentiment, such as a testimonial signed by all the men, or a small article made by themselves whose sole value lies in its sentiment. Of course, the totally unexpected gift, even though you are not in sympathy with it, must be accepted with the spirit in which it is given.

The taking of collections for presents for promoted workers is the most regrettable of all, and will not make the men happy with the spirit of giving. To the "bunch" it is merely the paying of tribute to the newly created king. You may say it is merely an expression of good will to a popular success, but you dare not risk passing up the unpopular collection.

—M. S. SCHWAM.

Who Should Select New Equipment?

WILLIAMS seems to have some rather good ideas, but this is one of his best. It cannot affect the influence of the foreman to get the man's opinion, for in a properly conducted shop it would be the foreman's job to put this selection up to the man, the man to report to him. Then he could take it to Williams. In this way, the man would feel his opinion was valued by the foreman, the foreman would retain his dignity, and Williams could satisfy himself and the shop by buying the machine indicated. —J. P. MCHALE.

IT IS a rare workman that will keep posted on the ever changing conditions in the machine tool field. This is the job for the men in charge of the mechanical operations of the plant, and it will keep them on their toes to keep informed on new developments. These men, if they are wise, will be on the good side of the men in the shop, as the operators always know things about machine tools that can only be acquired by running them.

This question of investing money in new equipment is too big to be influenced by the whims and fancies of an individual. We buy equipment based on the amount of money it will earn for us. Then we find an operator to run it that will get the most out of our investment both from his standpoint and ours. There is no sentiment connected with equipment purchases.

—ARTHUR A. MERRY.

Why They Decided Not to Use a Jig

I BELIEVE that in ninety-nine out of a hundred cases jigs do save time on production jobs. Of course, on experimental work, a jig may be used to save a gamble on accuracy, and may actually take more time, but in so doing it guarantees the fit of the job. If you don't use the jig, you may save time in doing the job as compared to the time of making the jig and then doing the job with it, but you may spoil the whole job, and then what a time you will have. —CARL SCHULTZ.

IF JACK could drill from a template and use a prick punch it seems feasible to provide a simple jig to fasten on the piece of work. Probably a simple template jig would do the trick, and by using it everybody would be happy, and the job would have been done to the best advantage. This time it seems Al gave in a little bit too soon. The time saved in prick punching, extra care in drilling, and the knowledge that a less skillful man could be put on the job in case Jack were needed some other place would well repay the little extra cost of a template jig. —J. C. P. BODE.

Who Should Do the Discharging?

I DO not believe that any foreman should have the power to discharge a man without the employment office endeavoring to place him on a job more fitting to his ability. The foreman should, of course, have power to remove an unsatisfactory worker from his department. The cost of placing a new man on the payroll prohibits promiscuous firing. Along with this is the matter of teaching new men the arrangement, and rules of the plant. No foremen can know of all the vacancies in a large plant, and that is where the employment office enters into the case.

—ELMER J. HAUER, *Foreman.*

FOREMEN should not have authority to discharge an employee. Special investigation for his dismissal should be made, and both stories should be weighed for facts. If the employee is worthy of a department transfer, then the supervisor can carry out his part.

Many foremen have discharged valuable employees because of some petty grievance against someone. I was once discharged for investigating facts concerning the speed record of the night shift, which my foreman falsified. When I confronted these facts to my foreman, he got angry because it showed him up with a falsehood. —GEO. MIHLAN.

Shop Visiting for the Foreman

A GREAT deal depends on the foreman's technical training as to what he will learn by visiting other sohps. The better this training is, the better are his chances of making use of what he sees in visiting other shops. —DAVID WILLIAMS.

IT IS a good idea of Williams to send Ed away to visit another factory. When a man begins to feel like Ed, thinking that he knows his business and has been running his department long enough to be thoroughly efficient, then it is high time that he got out for a change. He is getting in a rut and doesn't know it. He can quickly prove to himself that seeing more than merely the job in hand makes all the difference between being just a clever worker or a well versed executive.

Ed himself knows more than even his best man if for no other reason than because he goes from one to the other and sees what each one is doing. He is bound to learn by seeing the different methods of a number of men daily. If it makes the boss a better man because he can see what all his boys are doing, he will certainly become a very much better boss by seeing an entire plant and its methods.

I am willing to wager that when Ed gets back he will be wondering more than once why he has never thought of doing certain jobs the way they are doing them in another shop. Some of the hard nuts he is trying to crack right now, he will find have already been cracked for him by someone else. —J. C. P. BODE.

Ideas from Practical Men

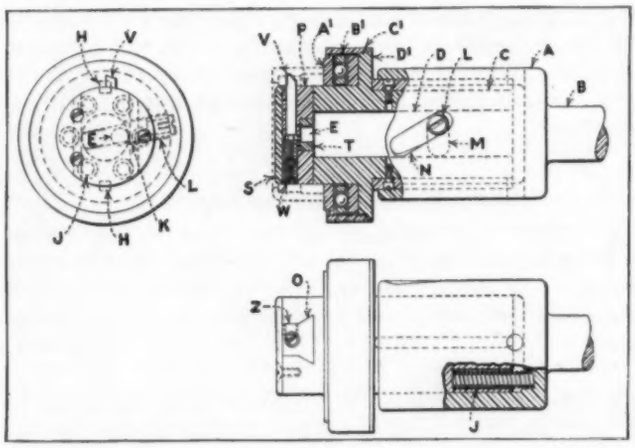
The department, "Ideas from Practical Men," is devoted to the exchange of information on methods useful to the machinery industries. Its scope includes all divisions of the metal-working industry, from drafting room to shipping platform. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for. The rates are from five dollars upward, according to their merit

Turret Tool for Internal Grooving

BY B. J. STERN

In the sketch is shown a turret tool for cutting an internal groove in the brass cup-shaped casting shown in heavy dotted lines. The casting is chucked by the outside and it is finished inside and on its face, as shown by the finish marks, using standard turret-lathe tools. It is then necessary to finish a groove inside to the form shown, and at a dimension that is held to close limits.

The tool consists essentially of three parts, the hollow case *A*, having a shank *B* to fit one of the turret holes, the sleeve *C*, and the shaft *D*, which has an eccentric projection *E* formed on one end. The sleeve is a



Tool for internal grooving

sliding fit in the body, but is prevented from turning in the latter by the two keys *H*. Six stiff springs *J*, equally spaced at the bottom of the case, exert pressure between the case and the sleeve *C*, tending to force the latter outward. The hardened stud *K* and the roller *L*, screwed into the shaft (which is a turning fit in the central hole of the sleeve) pass through the radial groove *M* in the sleeve and through the helical groove *N* in the case, thus preventing the sleeve from being forced out entirely. On the head of the sleeve is cut a dovetail groove as shown at *O* in which the toolblock *P* is a sliding fit, being retained by the plate *S*, which is screwed to the sleeve. This toolblock contains the hardened bushing *T*, which is a fit over the eccentric projection *E*.

It is evident that when the shaft is turned, the eccentric projection in turning with it will cause the toolblock *P* to be advanced. In a groove cut in the toolblock is the toolbit *V*, properly ground at the point and backed by the adjusting set-screws *W*. The set-screw *Z* clamps the toolbit in place. It will be noted that the groove for the toolblock is so located as to bring the cutting edge of the toolbit in line with the center of the work, as can be seen in the end view at the left. Properly located is the hardened and ground plate *A'* which bears upon the thrust bearing *B'*. Both ring and the bearing are retained by the collar *C'* which screws upon the ring *D'* of the sleeve *C*.

In operation, the tool is brought forward until the hardened plate *A'* strikes the finished face of the rotating work. The tool still being advanced, the sleeve *C* is forced back into the hollow case, compressing the springs, while the ball bearing takes up the thrust of the tool against the work, allowing the latter to rotate with but little frictional resistance. As the sleeve is pushed back, the roller *L* travels along the helical groove in the body, causing the shaft to turn, thus rotating the eccentric, which moves the toolblock forward and causes the toolbit to cut into the work, until the roller is stopped by reaching the end of the radial groove in the sleeve. At this time, the groove in the work has been formed to the proper depth. The pressure on the turret now being released, the springs cause the body to move back from the sleeve, keeping it tight against the work while the roller, traveling back along the helical groove, pulls back the toolbit from the work until it is entirely clear of the groove, thus preventing the work from being marred while the tool is being withdrawn.

This tool works very efficiently, due principally to the addition of the ball thrust bearing. No trouble at all has been experienced in the three years of its operation.

A Double-Wheel Swing Grinder

BY C. A. SHEPPS

The swing grinder shown in the illustrations was designed and built by me for use in grinding and polishing the valve-motion parts of locomotives, though it has been found very useful for like work on other parts having small radii.

In Fig. 1 the device is shown ready for action, while in Fig. 2 the constructional details are given. The drive is by a 2-hp. electric motor and the wheel spindle is at a right angle to the drive shaft. The spindle carries two wheels and is driven by heat-treated bevel gears running in cup grease. Ball bearings are provided both as bearings for the drive shaft and wheel spindle, and to take the thrust of the gears. The ball bearings are completely inclosed to exclude dust, except that those on the wheel spindle have deviating air passages for the purpose of ventilation.

The speeds of the motor and the wheel spindle are

Fig. 1—Swing grinder for locomotive work

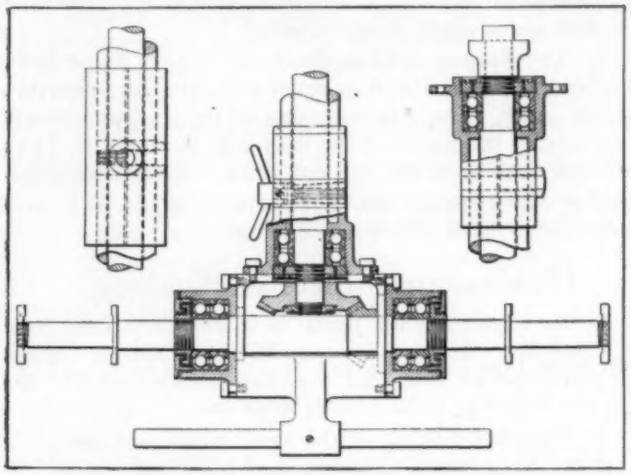


Fig. 2—Constructional details of the grinder

3,600 and 6,000 r.p.m., respectively, the gears being proportioned to increase the speed of the spindle over that of the motor by that amount.

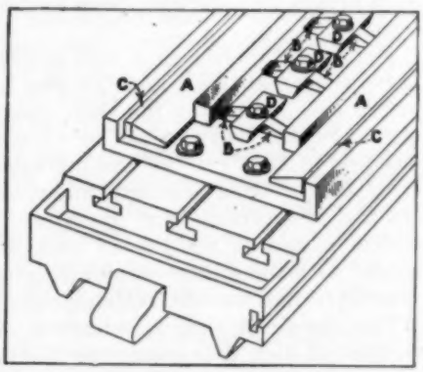
While the wheel for grinding the insides of links is smaller in diameter than that for the outsides, but one size of wheel, 3 x 3 x $\frac{7}{8}$ in., is carried in stock. When new, the wheels are used for the outside work and when worn below a given size they are used for inside grinding.

This machine has been in constant use for about two years. The gears show but little wear and the only parts having to be renewed are the two ball bearings on the wheel spindle.

A Time-Saving Fixture for the Planer

By H. L. Wheeler

The fixture here shown was built in a shop where a considerable part of the planer work consisted of long strips of various sizes that were required to be straight and parallel. It was made a regular part of the planer equipment and was seldom disturbed in its setting. Thus, when a rush job came in there was no time lost in setting up for a particular size, since the fixture accommodated all sizes within its range. The base of the fixture is tongued to fit one of the T-slots in the planer table, in order to take care of the alignment. Two long, hold-down strips *A*, one on each side, used in conjunction with the wedge-shaped fingers *B*, served to hold the work-pieces firmly. Spacing strips *C* were provided to place between the hold-down strips and the vertical ledges of the fixture to adjust it for different sizes of work.



Holding fixture for the planer

The blocks *D* at the center of the fixture applied the pressure to hold the work when tightened by means of capscrews screwed into the base. The fixture was used on a planer having two heads on the crossrail, so that two pieces of work could be planed at once.

Fixture to Hold Taper-Shank Reamers for Milling the Tangs

By Herbert M. Darling

The fixture shown in Fig. 1 was designed for the purpose of holding taper-shanked reamers in the milling machine to mill the tangs. It is inexpensive to build, two of them costing about $25, and it is very efficient in operation.

The body of the fixture is a block of cast iron, having two semi-circular grooves machined in the top to match

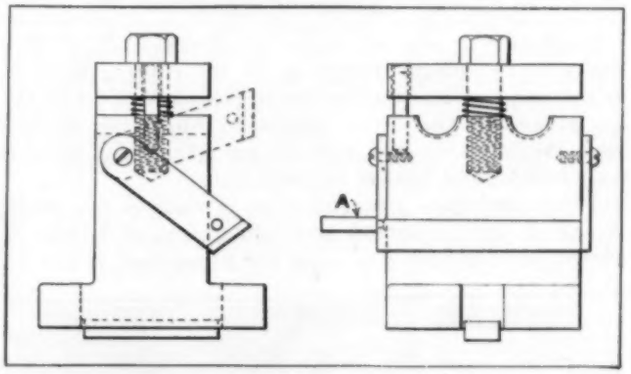


Fig 1—Fixture to hold taper shanks for milling

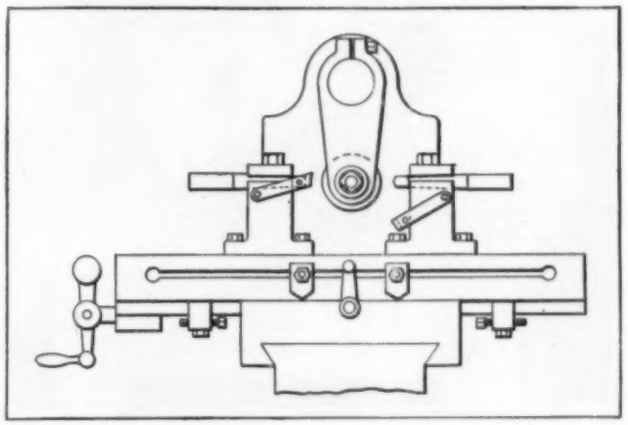


Fig. 2—A pair of fixtures on the milling machine

the diameter and taper of the shank to be milled. One strap clamps two shanks at once by means of the single capscrew between them. A coil spring encircling the body of the screw below the strap, serves to lift the latter off of the work when the pressure of the screw is released.

To locate the reamers endwise, a swinging stop is

brought up into position by means of the handle *A*, so that the ends of the shanks bear against it. As soon as the clamping bolt is tightened, the stop is allowed to drop by gravity out of the way of the cutters.

To use this fixture to best advantage, a pair of them should be placed on the table of a milling machine as shown in Fig. 2, with sufficient space between them to accommodate the cutters and a little extra room for the stops and for safety in reloading. Two pairs of straddle mills with suitable spacing collars are used, and, of course, two shanks are milled at each movement of the table. The machine, a standard milling machine, feeds in either direction and is provided with automatic knock-out, so that while the cut is running upon one pair of shanks the operator can be occupied in unloading, cleaning and reloading the opposite fixture.

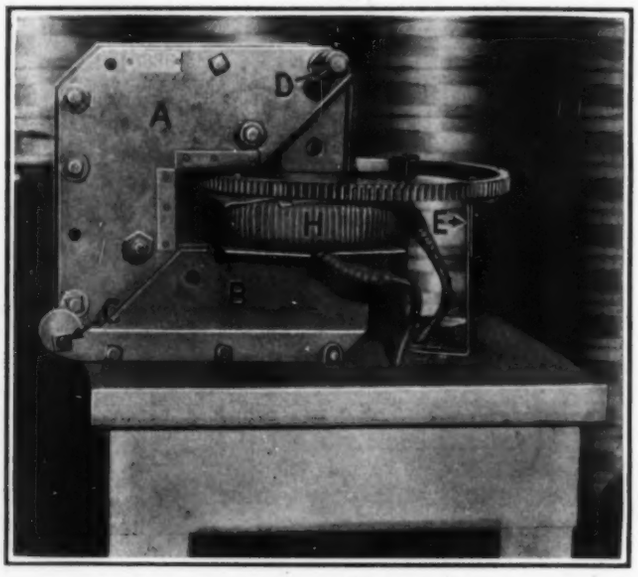
With one pair of these fixtures and two pairs of high-speed steel straddle mills, a boy can mill the tangs on 90 No. 2 Morse taper shanks of nickel steel in an hour, and since the reamers are located from the shank ends, the milling will be alike in every case. Because of the low cost of the fixture, it is designed to hold but one size of shank.

Electric Heat for Shrink Fits

BY CHARLES F. HENRY

In shrinking starter rings on flywheels it is very desirable to prevent distortion of the ring in heating, as far as possible. So the Pierce-Arrow Motor Car Co. has rigged up the device shown, in which the starter-ring is placed in the gap of an alternating-current transformer and heated by induction.

The transformer frame or core, is made in two parts, *A* and *B*, and is hinged at *C*, the insulated handle *D*, enabling the operator to raise the upper half to put in,



Electric heating for starter rings

or take out, a ring. Supports *E* hold the overhanging part of the ring while the inner part rests on asbestos laid on the coil *H*.

All that is necessary is to raise the upper half, put a starter ring in place, close the upper part and turn on the juice. The ring heats quickly and evenly in a very short time, and is dropped on the seat on the flywheel with little trouble.

Practical Shop Problems

Questions of a Practical Nature will be answered in this column

The Farmer Drill

Q. We have had a request for some Farmer drills, but are unable to locate any reference to such a drill in handbooks or catalogs. Can you inform us as to the kind of drill and method of manufacture?

A. The Farmer drill is simply a straight fluted drill, and can be found listed in small tool catalogs under the latter name. The original name of the drill apparently came from the name of the man who invented it. The Farmer drill does not run out when drilling soft material or when counterboring in tapped holes. It is also used for drilling interlapping holes.

Hardening of Steel in Pickling

Q. In cleaning steel parts in a sulphuric acid bath we find that the steel becomes hard and brittle. What is the cause of this, and how can it be avoided? We do not have the same trouble with brass in pickling.

A. This embrittling of the steel in the acid bath is a common occurrence, although it is not usually so noticeable except in springs that will be subjected to stress without further heat-treatment. The hardening action is claimed to be caused by the action of the hydrogen on the steel, and it increases with the increase in carbon in hard steels.

The original ductility of the steel can be returned by heating the parts, but as this method of treatment is not possible in hardened and tempered articles, they can be immersed for a period of from 5 to 10 minutes in boiling water, which will allow the steel to recover the greater part of its ductility.

Storing Forging Dies

Q. We are interested in keeping a better record of our forging dies, and would like to obtain the best ideas on the subject. We often have difficulty in locating the dies after they have been used, and then they are likely to need repair or adjustment. Could you suggest a method of controlling the dies?

A. The storing and checking of forging dies will resolve itself into a comparatively simple matter if you will place the responsibility for the tools up to the foreman of the forging department after providing him with proper tool storage space and simple rules of procedure.

Numbered shelves in a tool storage room should be provided for all dies, and the dies kept in place when not in use. A tag on the shelf should show where the tool is located when in use or when out for repairs. A notation of the "run" of the die should be made on the shelf tag or on a separate index card each time that the tool is returned from operation in the shop. An accurate record of the life of each die can thus be obtained with the minimum amount of clerical work. This procedure has worked satisfactorily in actual practice. Where the forge shop is extensive, and employs a large number of dies, it is sometimes the practice to place one or more toolmakers under the direction of the foreman, but such cases must be settled on their individual merits.

Notes on Leather Belts

The best leather for belting comes from carefully skinned steers. The careful selection and tanning of the hide by the manufacturer determines largely the quality of the finished belt. The best pieces are claimed to come from the middle of the hide along the spine. Single, double and triple-ply belts are manufactured.

The proper size for a belt to transmit a given load may be determined from the formula: $Hp. = \frac{VW}{F}$, in which V is the belt velocity in ft. per min., W is the width in inches, and F is a factor which depends upon the arc of contact, and has been worked out by experiment. It may be obtained from the accompanying table.

Factors for Various Arcs of Contact

Diam. Pulley	Belt	120 Deg.	140 Deg.	160 Deg.	180 Deg.	200 Deg.
Under 8 in....	Single	1,400	1,270	1,180	1,100	1,040
8-36 in.....	Single	1,240	1,100	990	920	860
Over 3 ft.....	Single	1,100	980	890	830	770
Under 14 in..	Double	800	730	670	630	590
14-60 in.....	Double	700	630	570	520	480
Over 5 ft.....	Double	630	560	510	470	440
Under 21 in..	Triple	560	520	480	440	410
21-84 in.....	Triple	490	450	410	370	340

Single belts will stand a stress of 60 lb. per in. of width and give good results. Corresponding values for double and triple belts are 105 and 150 lb. per in., provided that the pulleys are not extremely small. The difference in tensions between the two sides of the belt should not exceed 2 on small pulleys, 2½ on medium pulleys, and 3 on large pulleys. The hair side of the belt should run next to the pulley, as it clings better than the flesh side. If the hair side is run on the outside, it is also more liable to crack.

Size of Belts

Belt drives will not give good results if too short. The minimum distance between shafts should be four times the diameter of the larger pulley. Pulleys should be as large as convenient without producing a belt velocity greater than 5,000 ft. per min. At higher velocities centrifugal force increases the tension and diminishes the effective driving force. Pulleys on which shifting belts are to be run may be flat. All others should be crowned, as the belt tends to shift toward the greatest pulley diameter.

Leather belts are manufactured both plain and waterproofed, and should be chosen according to the purpose for which they are to be used. Waterproof belts are spliced with waterproof cement, and their surfaces are impregnated with a compound to make them resistant to moisture. Common leather belts should not be exposed to steam or dampness, nor should oil be allowed to drip on them.

Belts that are tight cause undue pressure on the bearings, which results in excessive friction, premature wear, and possible breakdowns. Sufficient slack should be allowed on horizontal drives so that the returning side moves with a loose, undulating vibration. Creep depends on elasticity, and in good practice will not exceed 1 per cent. Total stretch of the belt usually amounts to 6 per cent.

Single belts should be put on with the inside points of the laps running toward the pulleys. The outside point is more likely to be turned up by the air, or by striking something, than the inside point is from rubbing against the pulley. Double belts are run with the laps pointing away from the direction of running. Triple belts run the same as single belts.

Joining the Belt

The endless belt is best where it is possible to apply it. Splicing and cementing makes a stronger joint than any form of lacing, and will eliminate the thumping that occurs when a lacing passes over the pulley. Large belts and all belts that run at high speeds over small pulleys give better performance when made endless. Endless belts should never be run onto pulleys as one side may be stretched or pulled apart. The belt should be put over the pulleys, drawn together with clamps, and cemented in place. If the belt is manufactured endless, the shaft should be taken down and forced back in place after the belt has been put on the pulleys.

Various common methods of rawhide lacing, and several types of metal fastenings, are frequently used, especially for small belts. Some metal fasteners are claimed to make joints having 90 per cent of the belt strength, and they permit of very quick belt repairs. Vertical drive belts should not be made endless, but should have some form of quick fastening as they require frequent taking up.

Carbon tetrachloride is recommended by some belt manufacturers for cleaning belts, and is preferable to gasoline or benzol as it is non-inflammable. A good dressing should be applied occasionally to prevent belts from becoming dry and eventually cracking. There are several dressings on the market designed to prevent slipping. Rosin alone is injurious to leather belts.

Flap and wabble in belts may be caused by an irregularity in the cut-off, or by pulleys not properly crowned or out of line. Excessive slip may be caused by a belt that is too stiff or too slack, or by a pulley that is too small. Slipping may be reduced by covering the pulley with leather. A tightener should not be placed against the tight side of a belt. It should be against the slack side and about one-third of the way from the smaller pulley.

For the information given we are largely indebted to the belt manufacturers

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Technical Abstracts

Cracked Bell Repaired by Welding

After forty years of silence a cracked church bell in Taunton, Mass., has been repaired and made serviceable by electric welding.

The bell is 34 in. in diameter at the mouth, 18 in. at the top and is 26 in. high. The crack was 17 in. long. Phosphor-bronze welding rods were used, having an analysis of about 95 per cent copper and 5 per cent tin.—*Iron Trade Review*, Feb. 24, 1927.

Industrial Railways for Factory and Construction Work

Railway transportation facilities provided at manufacturing and industrial plants and on many construction works are of two distinct classes: Connections with main-line railways for receiving and shipping goods; and industrial or plant railways for inter-departmental service. Standard gage connections and sidings are required at most large plants. But whether these tracks should be extended through the plant for service purposes, or should be supplemented by a system of narrow-gage tracks, is a matter that must depend largely on local conditions and requirements.

Factors to be considered in deciding on the track gage suitable for a specific case may include: Comparative cost and convenience of standard and narrow-gage lines; necessity or advantage of extending the narrow-gage equipment to various parts of the plant; the economy of using narrow-gage equipment that does not leave the plant; the weight, the size and the character of the material to be handled; the length of the haul; the convenience or the obstruction of operations in the shops or other buildings; the clearance limits as to the radius of curves, the width of aisles, the height of the roof, and the width and the height of doorway openings; the tonnage handled daily and the number of cars required to handle such tonnage; the facilities for transfer between narrow-gage and standard-gage cars; and the type of motive power to be used.

It is generally advisable to extend the standard gage tracks into the building of the shipping or the erecting department and also into the raw material department since it is economical and otherwise advisable to do loading and unloading under cover. In certain cases the use of standard gage tracks through the plant has an important advantage in enabling the plant locomotives to shift cars. This feature may even facilitate shipment since at any time empty cars can be placed or spotted as required and loaded cars can be collected and switched to the outgoing track.

For light loads and shop service, as well as for special purposes, narrow-gage tracks may be preferred or necessary. Narrow gage lines at some plants form a comprehensive system to serve inter-department requirements. It has been claimed that where the haul is more than 1,200 ft. the narrow-gage is generally more efficient by reason of the smaller amount of power required and the relatively higher speeds. Of seven engineering concerns that specialize in the design of industrial plants, three say that the present practice tends to avoid narrow-gage plant trackage wherever possible, the standard-gage lines being extended where necessary or supplemented by other methods of transportation. But they all agree that narrow-gage tracks are necessary in certain kinds of plants.—E. E. R. Tratman, *Engineering News-Record*, March 3, 1927.

Buick Assembly Line

Three parallel assembly lines are used at the Flint plant of the Buick Motor Co., all housed in a space about 1,300 ft. long by 64 ft. wide. The maximum production is 1,300 units in a 9-hr. day. Beginning with the bare frame, the complete car emerges at the lower end 1¼ hr. later without having left the line.

The problem of parts storage and working space was taken care of by bridges or mezzanine floors placed above the assembly line proper. Here finished and sub-assemblies from the sixteen Buick factories converge in correct order and timing so that the men on the assembly floor always have the part needed at hand. Although there are nearly thirty different types of cars, there is no confusion and the parts match up at the various portions of the lines. A master schedule is prepared twelve hours in advance and from it the individual part schedules. Material schedules, however, are made up three months in advance from sales estimates.

With this system, inventory of parts on hand has been reduced 50 per cent. Handling labor charges have also been cut down by a like amount by the substitution of gravity and power conveyors. The most outstanding conveyor is the one whereby engines are delivered from the test room to the proper bridge, a distance of more than half a mile. Four conveyor-type enameling ovens, 800 ft. long, constitute another feeder of the unified line. At the unloading end of these ovens, parts such as fenders are loaded on wheeled racks and are then moved to their respective bridges by continuous chain conveyors. The parts are brought to the worker in such quantity that he must stick to business in order to hold his place in the gang. The entire department is paid at a rate based on a fixed price per completed, approved car.—*Automotive Industries*, March 5, 1927.

Commutator Maintenance

If the surface of a commutator is not kept trued up, it will become worn in grooves, especially if the brushes in the different holders are not staggered properly so that they wear the entire surface of the commutator. One of the easiest methods of truing up a commutator is by using a commutator stone. The size of the stone should be such that it can be worked freely between the brushes; in some cases this may require the removal of some of the brushes. Moving the stone endwise across the face of the commutator will help materially in doing a good job. Before applying stones, it is well to clean the surface of the commutator with a piece of sandpaper, as this will prevent glazing the surface of the stone and interfering with its cutting qualities.

Contrary to what might be expected, turning a commutator in a lathe does not insure a true surface when in operation. Due to the possibility of distorting the surface of the commutator by centrifugal force, the only way of insuring a true surface is to grind the commutator when turning at a normal speed. Whenever possible, it is best to operate the commutator at full speed and then drive the wheel at a rate that will give the best cutting speed. In this way the commutator is subjected to about the same forces that it is subjected to in normal operation.

A short circuit in a commutator, if on the outer periphery where most of them occur, can generally be repaired by carefully cleaning the defective mica out and filling the void with a commutator insulating compound. If the space is of considerable size, a piece of mica may be fitted and held in place with shellac. If any of the bars have been raised after the defect has been repaired they should be filed down level with the surface of the commutator and the commutator trued up with a stone. High mica is another cause of poor operation of the commutator. Where the copper wears lower than the mica, the brushes are lifted clear of the bar, and sparking results between the brushes and the bars which soon aggravates the condition by eating the copper still lower. Truing the surface of the commutator with a stone will relieve the trouble but will not, in general, make a cure. Undercutting the mica is generally the only permanent cure for this trouble.—E. O. Mills, *Power*, March 1, 1927.

Getting the Net Profit from Sales Conventions

Of all the merchandising tasks which management officials and sales executives are called upon to perform, making a profit from a sales convention is the hardest. The cost of a national sales convention, properly conducted,

is about $200 per salesman based on fifty men.

The first step necessary to make a sales convention show a profit is advanced planning. In order to relieve the sales manager of the entire burden chairmen of convention committees now include the credit manager, the traffic manager, the collection manager, the office manager, the production manager, the purchasing agent, and the works manager, not to mention the obvious additions of the advertising manager, the service manager, and the sales promotion manager. The sales manager should settle the date of the convention, its duration, the hours for sessions and the general program plan in advance. The date set should be one which will interfere least with the profits of the company.

In the old days there were but two types of national sales conventions. The first was the controversial type, and the second was the emotional type. The first consisted in tossing before the delegates topics for consideration and controversy. The second necessitated merely the gathering together of the entire sales force and silver-tongued platform orators. The two types of conventions were probably popular because they required no advanced preparation. Modern planning for sales conventions means a tremendous amount of work, and the unearthing of facts not previously known.

If the national sales convention is to pay a profit, there must be no unnecessary expenditures. Not a single man shall arrive unnecessarily early or be called upon to remain unnecessarily long. The convention should include individual conferences, attendance at group conferences, attendance at general sessions, and a trip through the factory or home office. Certainly, many companies do make national sales conventions valuable profit builders, using them to clarify points of policy, to acquaint salesmen with new products, to build up co-operation between the sales department and allied departments and the home office, and so on; but unless the size of the investment is known in advance and there is a willingness to work long, hard months in advance of the convention, it is better not to hold one.—*System*, March, 1927.

Soldering of Railway Motor Commutators

In order to make a double-loop coil of ribbon wire or insulated strap for armatures, which can be wound without forming the bottom leads during the winding operation, it is necessary to bring the leads to the commutator neck at an angle of approximately 45 deg. to the top lead. A triangular filler then must be placed between the top and bottom leads to take up the space. This filler is kept from sliding back in the slot by bending its front end to one side.

All drifting should be done on the filler in the top of the commutator slot and not directly on the leads. This precaution avoids the nicking of the copper. Swedging of the leads should be avoided also.

Sufficient clearance should be left between the conductor and the side of the slot so that the leads may be driven home without crowding, and to permit ample room for the solder. In figuring the slot width, 0.005 in. is usually added to the width of the conductor for wire coils, and from 0.010-0.015 in. is added to the width of the strap conductors. Removing the leads from the soldered commutator neck can be accomplished in four ways, namely, drifting the leads out cold; drifting after softening the solder; breaking the solder with a split tool; and remilling the slot.

To soften the solder, the commutator neck should be heated, preferably with a hot soldering iron. With a torch the commutator neck should not be heated too long at one spot as it will tend to anneal the copper. When the solder has softened the leads can be removed from the slot with a gouge. Solder made of half lead and half tin has a melting point of 181 deg. C. It flows readily and holds the metal firmly as long as the commutator temperature does not become excessive. Pure lead solder has a melting point of 325 deg. C. Although it is cheaper than half and half solder and has a higher melting point than pure tin, it cannot be worked easily. Where the operating temperatures of the commutator are high, pure tin solder should be used. It has a high melting point, 230 deg. C., and when molten it flows easily and rapidly. It is not necessary to tin the slots before soldering an armature if the slots are painted properly with a liquid flux immediately after slotting, and if the commutator leads are tinned well.—Jesse M. Zimmerman, *Electric Railway Journal*, Feb. 19, 1927.

The Trial Wheel Situation

If all wheel manufacturers would standardize on grain combinations in their wheels the same as they do on the list price it would not be necessary to submit samples, as we know that some ceramic engineers believe in specific kinds of clays for bonding wheels for certain precision grinding operations.

I recently visited a small wheel plant, and was taken into the laboratory, where a gentleman showed me a wheel 1¼x1¼x12 in. in size which was supposed to be a 50 grit, grade M wheel. It had as high as eight grain combinations in it. Now in order for some other wheel maker to duplicate this it would be necessary for him to tear down a piece of the wheel, screen it, and then weigh the grains to determine how much of each size was in it. If the Grinding Wheel Manufacturers Association can standardize on list prices, it is my opinion that it could standardize on grain combinations as well.—B. A. Taylor, *Abrasive Industry*, March, 1927.

Machine Tool Failures

The failure of machine tools in the production line of an automotive plant is serious and costly particularly if there happens to be no accumulation of finished parts to tide over the emergency. Failures are due to three causes: lack of lubrication; overloading and other carelessness; and poor design or construction. Positive force-feed lubrication is therefore recommended, or manifold oilers with sight feed.

Operators should keep the machine free from chips to prevent jamming. Work should be securely fastened and the tools kept sharp. Castings that are too hard or have an excess of stock should be removed from the machine.

Interlocking handles or clutches should be provided to prevent a careless operator from wrecking a machine. Shear pins should also be used to prevent excessive overloads. Machines should be designed so that chips and cuttings are easily gotton rid of and are kept away from the ways, lead screws, gears, and the like.—E. R. Stoddard, *Journal of the Society of Automotive Engineers*, March, 1927.

The Application of Japan Finishes

There are many methods of applying japan, some of which are more economical than others, depending upon the nature of the article to be japanned. Brushing is a common method, but a skilled man is required for this job. A good paint brush hand is not necessarily a good japanner, due to the fact that japan is more viscous than paint. The brushes used in japanning are very important as not every kind of brush will do. Brushing may be preferred to other methods for finishing such objects as machine parts with many surfaces, some of which have to be kept free of finishing material.

Dipping is the quickest and cheapest method of japanning and, where it can be used, there is little chance for competition by other methods. Many jobs that are now brush painted and dried in the air could be more economically jappanned, by the dip method, and baked.

There are, in general, two methods for gaging the proper consistency of a japan dip: by means of an hydrometer, and by means of a viscosity cup. When the proper viscosity is determined by experiment, it is a simple matter each day to put in enough turpentine or benzine to maintain the viscosity at that figure.

Flowing might be termed a dip method in which the coating material is applied on only one side of the metal. In the gravity method the japan is unusually fed from the floor above through a hose. Articles as big as an automobile body may be coated as the operator walks around the body, which rests upon a truck.

Japan may also be applied by means of a flowing machine which is mounted on a small truck including an electric pump, a drain tank, a very fine strainer, a regulating valve, a flexible hose, and an application nozzle. A drip trough is provided which is lined with paper each day in order to keep the apparatus clean. The paper is burned at the end of the day.

Some of the best finishing is done by the tumbling method. The articles to be finished are placed in a tumbling barrel with a small amount of japan and the barrel is revolved for a short time, after which the articles are placed on trays and taken to the ovens. The gravity of the japan used is very important as well as the amount of the charge and the speed of the barrel, but these factors can all be determined by experiment.—W. J. Miskella, *Fuels and Furnaces*, March, 1927.

American Machinist

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

Established 1877

Nationalizing Industrial Problems

THIRTY-SIX state legislatures have definitely rejected the constitutional amendment restricting child labor. Certainly no greater proof is needed to show that the country as a whole has now reached a point where it is antagonistic to the invasion of the rights of individuals by centralized bureaucracy.

This proposed amendment was sponsored by individuals outside of industry, and advocated by certain women's magazines working apparently from a sentimental standpoint. The point seems to have been lost by them that economics cannot be forced by repressive laws. The fact was also ignored that such laws, having mainly to do with the personal affairs of the people, are centralizing in government bureaus professional office seekers, choking the courts with a hopeless tangle of petty cases, and providing an endless field for graft and corruption.

The amendment was opposed by the National Association of Manufacturers and by the Farm Bureau Federation because such nationalization of the rights of minors would prohibit all work by them without regard to the aspects of any individual case. The employment of children in industry has been constantly diminishing. Moreover, the working conditions for minors have been bettered, and in many cases industrial plants have provided educational training for minors in their employ. Where the regulation of industrial or personal conditions is left to local authorities there is opportunity for the appeal of individual cases. The defeat of the child labor amendment shows that the country now appreciates this fact, and it may be a sign that in future industry will be left more free to work out its own economic problems.

Metric Agitation Is Not Dead

CONTINUE to watch the metric situation. There is danger that the next great offensive will be made by way of state legislatures. Hitherto it has been necessary to combat activities to bring about compulsory adoption of the system in one place only—Washington.

Non-industrial states might appear to be the easiest to convert, and therefore the first to be attacked by the protagonists of metrics. But remember that almost every member of a legislature is non-technical, therefore subject to conviction by plausible argument concerning a technical subject. There is also the advantage to be gained by the surprise attack upon the stronghold of English measures—the industrial state.

In anticipation of the state attack, particularly in the industrial states, the legislators should be forewarned and forearmed. Individual as well as concerted action by the manufacturers of the metal working industries is recommended.

The Business Outlook and Confidence

IN AN exceptionally able review of the business outlook, Henry A. E. Chandler, economist of the National Bank of Commerce, New York, states that the "essential conditions to the maintenance of a high volume of business in a reasonably self-contained economic unit such as the United States are:

"1. A high degree of productive efficiency.

"2. A wide distribution of income and a high standard of living.

"3. A proper balance between consumption and saving, and in capital equipment as among the various industries.

"4. Ample credit facilities well controlled.

"5. Confidence in the future."

As concerns Nos. 1, 2, and 4 there are no misgivings. Admitted that No. 3 offers some room for speculation as to the future of the building and farming industries, there remains No. 5 as the least controllable and at the same time a very influential essential.

The metal working industries, because they are the first to feel depression and the last to recover, are probably the most susceptible to dampened ardor. It is gratifying to find no lack of confidence now in spite of less business during the early part of the year than was enjoyed for the same period last year.

No small part of the existing optimism is due to the discovery by equipment builders that they have a large field opening to their efforts in ridding industry of the obsolete, in selling their equipment on the basis of what it will do, and in rendering existing equipment obsolete by new designs.

The equipment user is finding that his interests are the same as those of the equipment builder. He profits by producing at the low costs that accompany the use of modern equipment, and thus the mutuality of the equipment transactions results in confidence. It is in the basic, or equipment industries that the existence of a steady confidence will have the greatest effect in maintaining a high volume of business.

Shop Equipment News

Farmer Lubricating System

A MECHANICAL lubricating system, designed for positive lubrication of machine parts with solidified transmission oil from a centrally controlled point, has been developed by the Farmer Lubrication Systems, Inc., 2611 Sixteenth Street, Detroit, Michigan. The system was originally designed for lubricating the chassis of motor cars, but it has since been developed for industrial uses. In Fig. 1 the device is shown installed in a large Toledo toggle press where in one minute 132 points are lubricated, an operation that formerly took two hours.

The lubricating system consists of four main parts: a pressed steel reservoir which holds about three months' supply of heavy oil; a screw- or plunger-type compressor which gives over 1,000 lb. per sq.in. pressure; connecting each bearing, a positive automatic valve, which both measures and forces the lubricant into the bearing, and a pressure gage which indicates that the system has functioned properly. The amount of pressure exerted by the compressor keeps the oil line constantly supplied with lubricant and there can be no air pockets or empty pipe lines. As soon as the proper quantity of oil has been given a bearing, the valve automatically closes, thus eliminating waste.

The reservoir, shown in Fig. 2, is made in various sizes, depending on the nature of the installation. The single machine reservoir holds enough oil to lubricate thirty or forty bearings for three months. Larger reservoirs are also obtainable. An oil check valve located below the bottom of the reservoir prevents the return of oil when the pressure is applied on the plunger by means of a screw. The screw is usually hand operated by means of a capstan, but where desired motor drive can be obtained.

The measuring valve, shown in Fig. 3, is designed to supply the correct amount of oil to the bearings. This is done by regulating the distance of travel of the valve piston, the piston seats being located at varying distances from the piston head. The illustration shows the piston back against the copper gasket, shutting off the main supply line. In this position the valve is ready to receive oil. When pressure is applied, the piston is forced forward and the oil passes into the measuring chamber of the valve. When the pressure in the valve equals that in the line, the piston again moves forward, forcing the measured quantity of oil into the bearing. After the piston has traveled its full length, it seats, thus shutting off the entrance of any more oil, no matter how much additional pressure may be applied. If the pressure is released, the spring

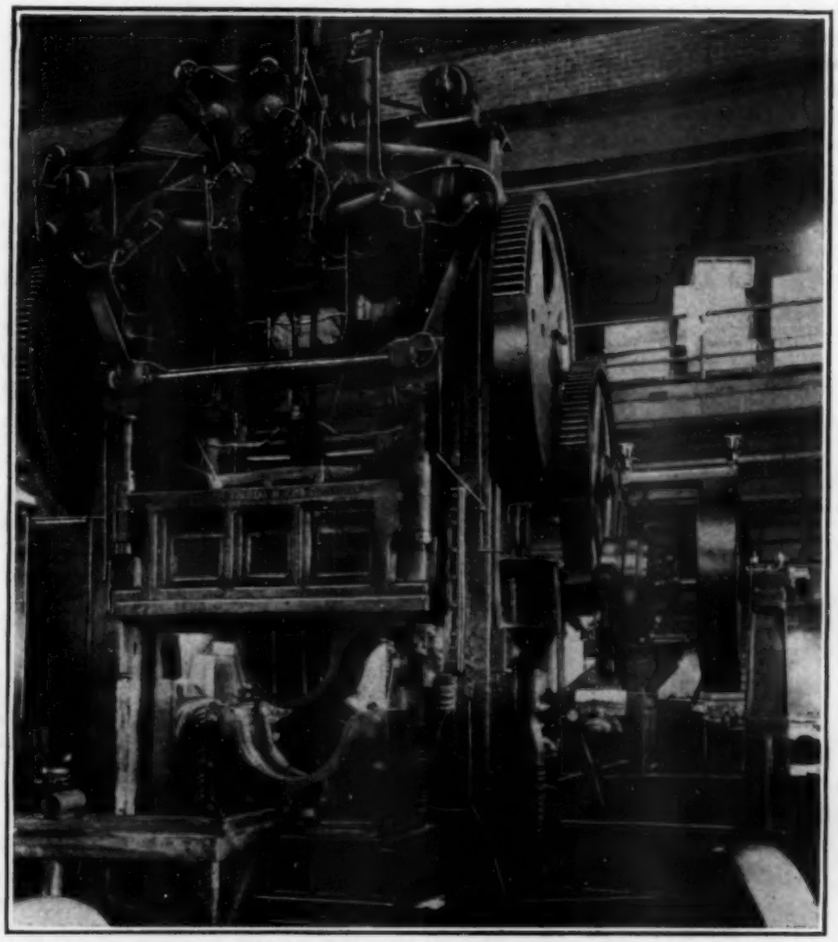


Fig. 1—Farmer Lubricating System Applied to a Toledo Toggle Press

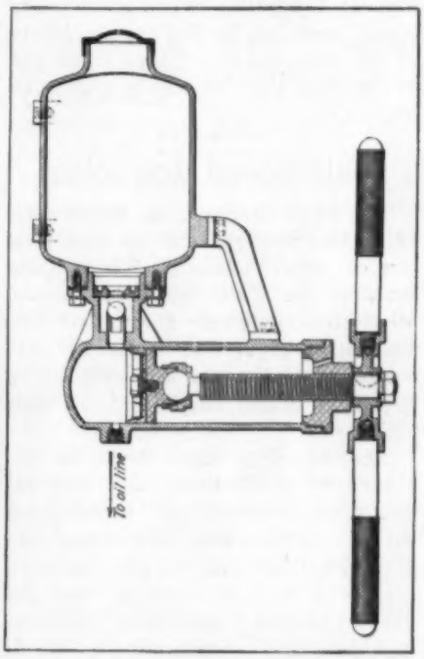


Fig. 2—Reservoir and compressor

Shop Equipment News

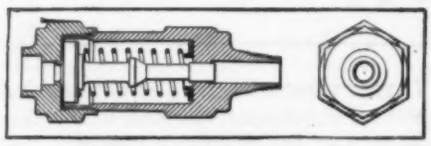


Fig. 3—Measuring valve

forces the piston back into the position shown and the piston is ready for the next application of lubricant.

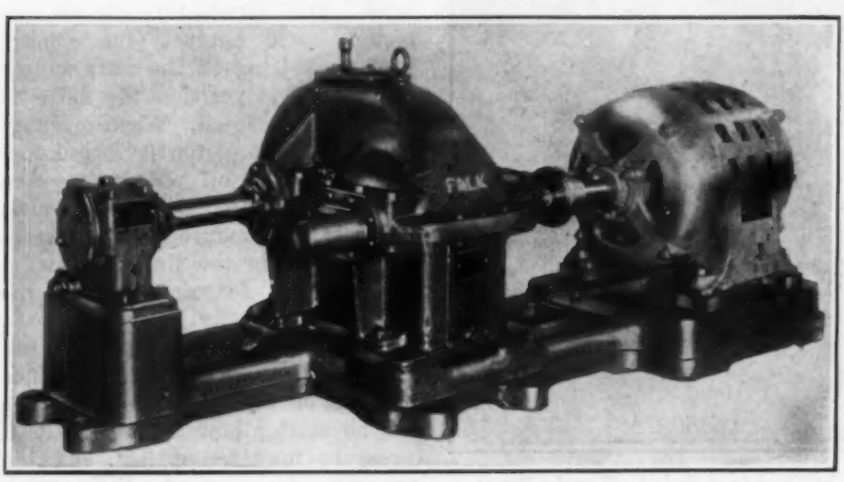
The pressure gage indicates the amount of pressure in the line and shows the operator when all valves are functioning. It is mounted near the operating position. Special ball joint fittings relieve all strain on the pipe at the point where movements occur, such as in the toggle joints of the press shown. These joints are so designed that leakage is said to be impossible.

Falk Speed Reducers

The Falk Corporation, Milwaukee, Wis., has brought out an improved line of speed reducers. These units feature the Falk continuous-tooth, all-steel herringbone gears, and like the units previously built by this company, the gears are said to be precision made, silent and of high efficiency.

The housings have been so designed as to eliminate any internal ribs, projections, or complicated cores. In this way lubrication has been simplified, and the possibility of dirt or core sand working into the gears lessened. Additional features include the airplane-type, steel-backed, babbitt-lined bearings, which are capable of carrying heavy loads, and an improved automatic continuous lubricating system.

The line is put out in a certain number of standard reduction ratios. Standard motor beds have been adopted for these units, in accordance with general industrial demand. The reducers are made in three types: Single-reduction units for ratios up to 9 to 1, double-reduction for ratios up to 70 to 1, and triple-reduction units for ratios up to 300 to 1. The No. 7D double-reduction unit is shown in the illustration.



Falk No. 7D Speed Reducer

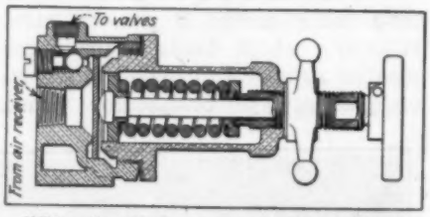
"Simplate" Differential Pneumatic Unloader

Air compressors made by the Chicago Pneumatic Tool Co., 6 East 44th St., New York, N. Y., are now being equipped with an improved "Simplate" differential unloader. A cross-sectional view of the device is shown in the accompanying illustration.

The valve proper is a single plate of stainless steel ground to a flat surface. The periphery is ground to fit in the cap with a few thousandths of an inch clearance and the edge is well rounded to prevent its sticking as a result of cocking on the seat. The cap also contains a ball check valve held against the seat by an adjustable spring. The flanges by which the unloader is attached to the compressor or panel are on the cap so that the device can be dismantled for examination or cleaning without disturbing the piping or other valves. It is said to operate with a 5-lb. range between unloading and loading the compressor.

With an unloading pressure of 100 lb. per sq.in. and a reloading pressure of 95 lb., the device operates as follows: As the air pressure rises to 100 lb., the pressure on the upper side of the valve plate balances that of the spring on the under side and air escapes past the seat into the annular space around the outer edge of the disk. Because of the close fit of the disk in the cap and the presence of the ball check valve, the air cannot escape and a slight pressure is built up, which, acting upon the surface of the disk, balances the pressure of the spring on the lower side of the disk and moves it down against the seat. The ball check valve is then exposed to full receiver pressure and immediately moves off its seat and uncovers a ¼-in. hole, allowing the air to pass through to the unloading inlet valves.

Upon a drop of receiver pressure to 95 lb., the spring pressure against the disk balances the air on the other side and permits leakage past the lower seat into the space around the stem. This leakage is restricted slightly by the upper spring holder, which is a moderately close fit in the body, and a slight overbalancing pressure is built up. This causes the valve disk to return to the upper seat with a positive movement and air is vented from the unloading piping past the upper spring holder.



"Simplate" Improved Differential Pneumatic Unloader

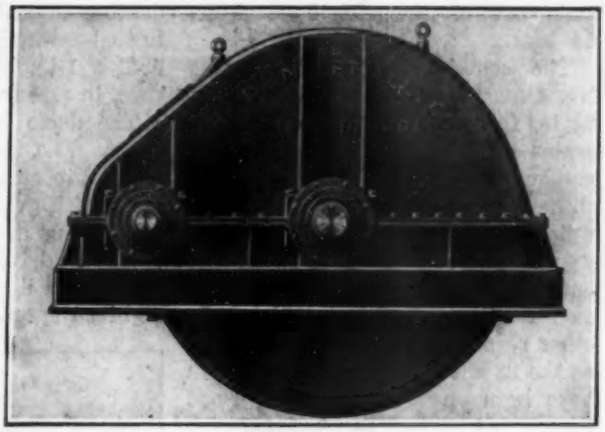
The unloader is now built for standard pressures from 50 to 125 lb. per sq.in., for low-pressure work of 40 lb. or less, and for high-pressure work up to 500 lb. per sq.in.

Nuttall Series MS and MR Mill-Type Speed Reducers

The R. D. Nuttall Co., Pittsburgh, Pa., has placed on the market a series of reduction gear units for heavy service, known as the series MS and MR mill-type units. There are six units in the series, and they completely cover a range from 150 to 2,000 hp. They are designed for services that require transmission of heavy loads at relatively high speeds, such as the main and

Shop Equipment News

auxiliary drive for crushers, hoists, pumps, and similar heavy equipment. The units are equipped with either 7½-deg. single helical gears or with herringbone gears, treated or untreated, depending upon the application. They are furnished as desired with either sleeve or Timken tapered roller bearings. It is possible to replace one type of bearing with the other, since the housings are identical in both types. However, new shafts would have to be used.



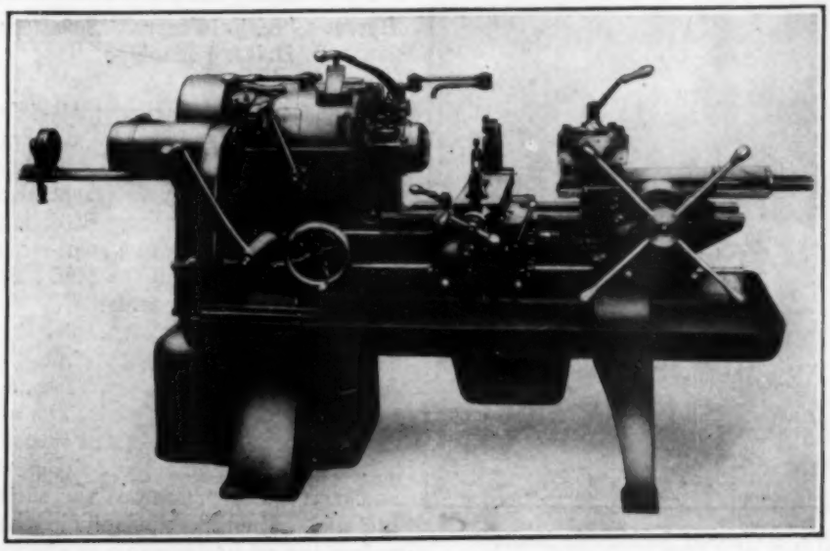
Nuttall Mill-Type Speed Reducer

The gears are totally inclosed in cast-iron cases and are carefully protected from grit and dirt. The bottom of the case serves as a reservoir for lubricant. The gears run in a bath of oil, while the bearings are lubricated by a positive splash system. The same lubricant is used for both gears and bearings.

Warner & Swasey Improved No. 4 Turret Lathe

A SIX-SPEED, all-geared head with a new power feed cross-slide has been added to the No. 4 turret lathe made by the Warner & Swasey Co., Cleveland, Ohio. Previously this lathe was made in two types of head, the cone head and the twelve-speed, all-geared head, and with one type of cross-slide, that of the plain screw feed. The machine has a bar capacity of 1½x10 in. and will swing work in the chuck up to 8 in. in diameter.

With the power-feed cross-slide, six power cross feeds are provided. These feeds are selected by means of levers mounted on the carriage apron within convenient reach of the operator. Longitudinal feed is obtained by means of a handwheel mounted on the front of the machine near the head end. A round tool post is provided on the front of the power-feed cross-slide carriage and a holder in the rear of the carriage is for use with a cutting-off tool.



Warner and Swasey Improved No. 4 Turret Lathe

When a plain screw-fed cross-slide is desired, both the cross feed and the longitudinal feed are operated by separate handwheels. The handwheel for the longitudinal feed is mounted at the front end of the turret lathe near the head end, and the handwheel for the cross feed is at the rear end of the screw-feed carriage. The tool post equipment is the same as that furnished on the power-feed cross-slide.

General Electric No. 880 Protective Paint for Pipe Joints

The General Electric Co., through its merchandising department at Bridgeport, Conn., is marketing an improved paint for sealing joints against oil, water or gas leaks. The product is known as G-E No. 880 red protective paint. It can be used for many purposes where red or white lead is ordinarily used.

The paint, which is dark red in color, requires no priming and can be applied by brushing or dipping. Denatured alcohol is used as a thinner. It dries rapidly and produces a hard, smooth, glossy film which is easily cleaned and which prevents excessive collection of dirt and conducting material. When used with electrical apparatus surface leakage and subsequent carbonization of the surface is decreased.

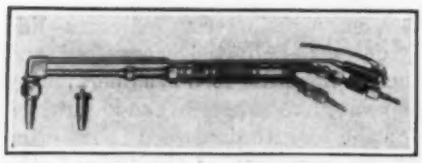
This paint was developed particularly for use in the manufacture of fuel oil burners. It also has application for plumbing work, chemical plants and many other places.

Prest-O-Weld Cutting Attachment for W-101 Welding Blowpipe

The Oxyweld Acetylene Co., 30 East 42nd St., New York, N. Y., has recently added to its line the CW-101 cutting attachment for its W-101 welding blowpipe. The attachment is intended to handle occasional rather than continuous cutting work, especially when the amount and nature of the work done does not warrant the purchase of a separate cutting outfit.

The device can be attached or disconnected from the welding blowpipe with rapidity and ease. It is fitted

Shop Equipment News



Prest-O-Weld Cutting Attachment for W-101 Welding Blowpipe

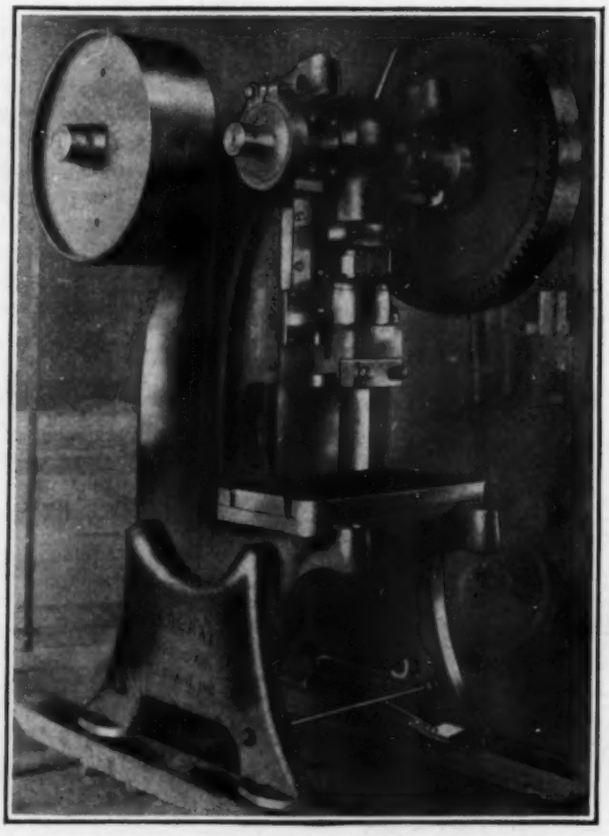
with two nozzles and will handle steel and wrought iron up to 1½ in. in thickness. The oxygen pressure required for the attachment is practically the same as that of the regular Prest-O-Weld C-101 cutting blowpipe. A table of cutting pressures is included in the instruction pamphlet furnished with the attachment.

Federal Nos. 4 and 5 Geared Inclinable Presses

The Federal Press Co., Elkhart, Ind., has recently added two sizes of geared presses to its line of open-back inclinable presses. The No. 5G machine is shown in the accompanying illustration in the plain type.

These geared presses are built in either plain geared or combination geared types. To change them from plain to the combination geared type, it is only necessary to attach a belt rim. The press may be then operated as a plain flywheel type. The geared machines are driven by tight and loose pulleys. In the No. 4G machine the pulley is 22 in. in diam. by 3½ in. face and operates at 240 r.p.m., while in the No. 5G machine the pulley is 28 in. in diam. by 4½ in. face and operates at 260 r.p.m. The gearing ratios are respectively 5 to 1 and 5½ to 1, resulting in ram strokes of 48 and 47 strokes per min., respectively. The pressure exerted at the ram on the No. 4 machine is 42 tons and that of the No. 5 machine, 54 tons.

The combination wheel for the No. 4 machine is 31 in. in diam. by 5¼ in. face, weighs 580 lb., and operates at 120 r.p.m., while the corresponding wheel for the No. 5 machine is 36 in. in diam. by 6¼ in. face, weighs 780 lb., and operates at 115 r.p.m. The same number of strokes and pressure at the ram is obtained as for the plain geared models. In other respects the design is the same as the flywheel-type machines, which have been on the market for some time.

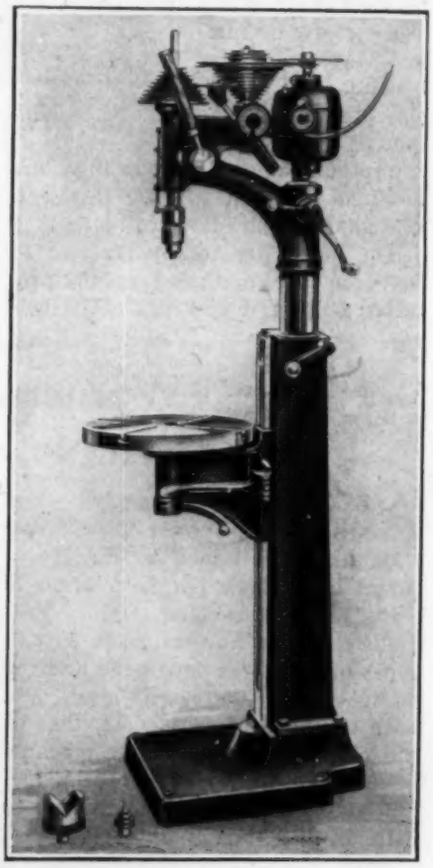


Federal No. 5 Geared Inclinable Press

Ryerson "Little General" Sensitive Drilling Machine

The conventional design of sensitive drilling machines has been avoided in the "Little General" machine illustrated, made by Joseph T. Ryerson & Son, Inc., Chicago, Ill. The machine is designed to meet the needs of general shop and tool room service. Its wide range and variety of speeds can be readily adapted also to production work when required. With straight shank drills, it has a drilling capacity of ½ in. By using turned-down shanks, it is possible to drill a 1-in. hole in brass or, with care, in cast iron.

The drive is effected through V-disks. The disks are made of fibre, tapered to an angle of 18 deg. They mesh with grooves disposed at a corresponding angle, giving a positive friction drive. A direct-reading speed-shift dial indicates each of the eighteen speeds and the size of drill best adapted to the various materials.



Ryerson "Little General" Sensitive Drilling Machine

The spindle swings in a complete circle around the column, thus enabling the operator to reach large and heavy pieces in any direction. The table also swings in a semi-circle and both the table and the head have large vertical adjustments.

Other advantages claimed for this drill are: The long reach from the drill to the column; the small number of levers and working parts; the accurate depth gage graduated in both inches and millimeters; and the quick and convenient provisions for shifting and adjusting the spindle that reduce the set-up time to a minimum.

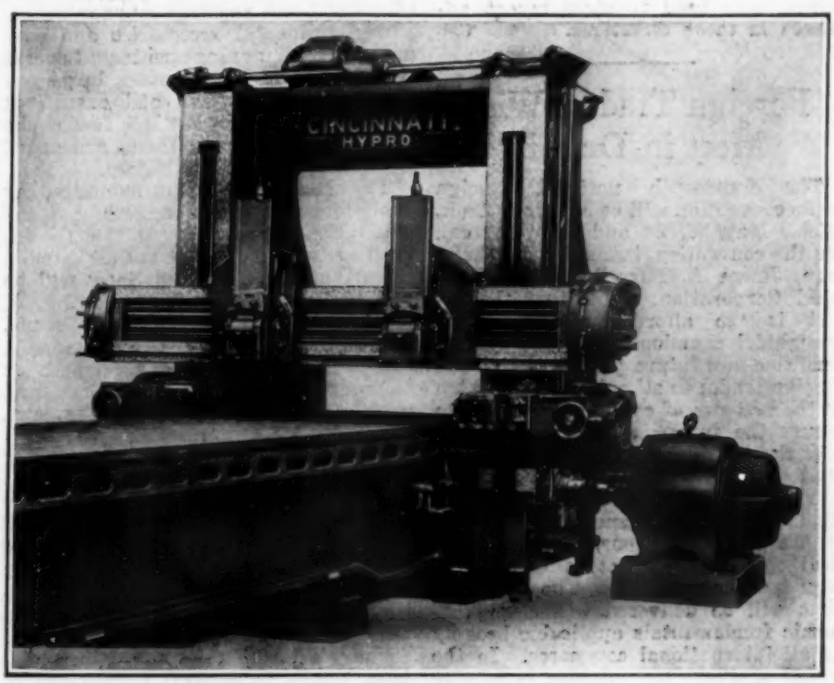
Shop Equipment News

Duo Control on Large Size Cincinnati "Hypro" Planers

THE Cincinnati Planer Co., Cincinnati, Ohio, has recently made a change on its large size Hypro planers so as to enable the workman to operate the machine from either the right- or the left-hand side. There is a duplicate set of levers on the left-hand side of the planer so that it is possible to engage the rapid traverse or the feed to raise or lower the rail, or to loosen or clamp the rail from that side of the planer as well as the right-hand side.

The down slides on the rail heads are independent of each other. Sliding gears and clutches back of the saddle have been eliminated. In the improved design the gears are always in engagement and two feed rods are provided on the rail. With this construction it is possible to feed down one slide while the other slide is being rapid traversed. When the machine is operated by two men, the one on the left of the machine can control the left-hand head from his side without asking the operator on the other side to assist him. In this way set-up time can be reduced as well as the time lost between cuts.

The machines also embody an improved support to the harp. There is a radius cast on the top of the saddle and the harp is held to this by means of a clamp. With this clamp on top of the saddle, the leverage is thus increased and greater rigidity is furnished the slide when it is below the bottom of the rail.

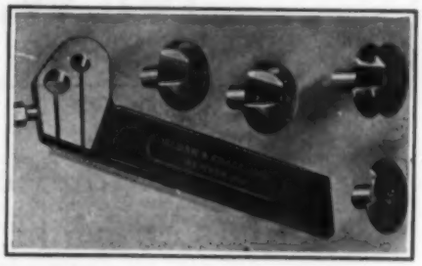


Duo Control on a Large Cincinnati Planer

Sloan & Chace Lathe and Planer Radius Tool

A set of circular radius tools and holder for use on lathes or planers is now being marketed by Sloan and Chace, Inc., 351 Sixth Ave., Newark, N. J. Each set consists of a patented tool-steel holder with a standard shank of ½x1¼x6¾ in., fifteen tool-steel convex cutters for forming arcs ranging from ⅛ to 1 in. in diameter, one cutting-off tool, one 60-deg. threading tool and a wrench. The cutting-off tool is so made that clearance is maintained throughout the cutting circumference by gradually tapering down the thickness of the outside cutting edge.

The cutters can easily be ground and will last a long while before the entire cutting circumference is used up. Each cutter has a round stub shank that fits in a corresponding hole in the holder which is slit to afford a clamp for the tool. These cutters were formerly made by the R. G. Smith Tool & Manufacturing Co. of Newark.



Sloan & Chace Lathe and Planer Radius Tool

Trade Catalogs

Electrical Instruments. The Roller-Smith Co., 233 Broadway, New York, N. Y., has issued supplement No. 1 to its Bulletin No. 100, describing its various types of ammeters and voltmeters for signal system testing. The leaflet is illustrated.

Flexible Couplings. The Brown Engineering Co., Reading, Pa., has published bulletin No. 28 on its "Kanti-Lever" resilient couplings. The publication contains twelve 8½x11-in. pages and is well illustrated throughout by means of photographs and cross-sectional views. The construction of this device is completely explained and test data are presented to indicate the shock resisting qualities. Complete ratings of the various sizes are given. The Brown new-type shear pins are also described.

Relays. The Roller-Smith Co., 233 Broadway, New York, N. Y., has issued supplement No. 1 to its bulletin No. 550 covering the new type FR relays for use with either alternating or direct current. The construction of the instrument is completely described and its possible applications are pointed out. The leaflet is illustrated.

Pamphlets Received

Foreign Trade. The Bureau of Foreign and Domestic Commerce, Washington, D. C., has published Trade Information Bulletin No. 460 describing foreign trade of the United States in 1926. The publication contains forty-four 6x9-in. pages and sells for 10 cents. Various statistical information is given in thirty tables and thirteen charts. General trends are first discussed and then specific commodities are taken up in turn.

NEWS OF THE WEEK

Chicago A.S.M.E. Section Meeting Hears Papers on Manufacture and Cost

Largest attendance on record

A paper on the development of economical manufacturing methods and a discussion of the stellite process were the main subjects presented at the third meeting of the Machine Shop Practice Division of the Chicago section of the A.S.M.E., held in the Machinery Club on March 16.

Approximately 175 members and guests were present. The meeting included an afternoon and an evening program, both of which were introduced by industrial motion pictures.

In addition to the A.S.M.E. attendance, there were present members of the mechanical division of the Rotary Club, the Machinery Club, the Western Society of Enginers and the National Pressed Metal Society. The meeting was opened by a short address by Hugo Diemer, chairman of the Chicago Section, and then turned over to Frank W. Curtis, Western editor of *American Machinist*, who presided.

REDUCING COSTS

Following a motion picture showing operations performed in a watch factory, presented by the Elgin National Watch Co., Adolph Langsner, chief engineer and superintendent of the Eugene Dietzgen Co., Chicago, delivered an address, "Changing Manufacturing Methods to Reduce Costs." The paper outlined a production system developed by Mr. Langsner, and including modern cost recording and the procedures followed in the designing and building of tools and special machinery. Such points as the duties of the engineer, the necessity of mechanical devices, the reduction of manufacturing costs without sacrificing quality of the product, the elimination of waste, and the selection of materials, were discussed. The talk was illustrated by slides.

The second paper, "Stelliting of Metal Parts Subjected to Wear," by E. F. Smith, district sales manager, the Haynes Stellite Co., dealt with the characteristics of Stellite, and emphasised the use of this metal for welding purposes. Instructions for application were included, these being adhesion of the rod to base metals, the proper heats to apply, surfacing large parts and work having thin sections, coating parts subjected to shock, and the machining of welded units.

A motion picture, "From Mine to Consumer," by the American Brass Co., opened the evening session. This picture traced the manufacture of brass and copper from the mine through the various mill operations, including rolling, extruding and hot pressing, also an outline of the laboratory control required to maintain uniformity in the various operations. President R. W. Barry of the Machinery Club, welcomed the members of the participating societies in a brief talk following this picture.

The first paper, presented by Ernest F. DuBrul, general manager of the National Machine Tool Builders' Association, was "Machinery's Contribution to Wealth and Welfare." The paper, relating to the transfer of skill and the transfer of thought or intelligence from men to machines, was published last week.

The final paper, "Automatic Feeding Devices for Machine Tools," by W. W. Nichols, vice-president and mechanical engineer, D. P. Brown & Co., Detroit, pointed out that economical production depends largely on the handling of material in machines, and that automatic devices often will permit great savings because one man can be called upon to operate two or more machines. The cost of application, the advisability of installation, the factor of safety, and the character of the work to be handled, were points covered in the address. Slides were used to show recent advances in these directions.

Foreign Traders Will Meet in Detroit

The fourteenth national foreign trade convention will be held in Detroit, Mich., May 25, 26 and 27. The call for the convention, issued by the chairman, James A. Farrell, of the U. S. Steel Corporation, states that the object is "to afford opportunity for thoughtful examination of the present condition and future possibilities of our foreign trade; to stimulate co-operation in the best use of our resources, and to secure the judgment of practical and experienced traders on the problems that confront us."

The convention program includes two kinds of sessions, general and group. In the general sessions, it is sought to deal only with subjects affecting foreign trade as a whole. The addresses that will be delivered will cover economic fundamentals applicable broadly to all international commerce. In the group sessions, the purpose is to give intensive consideration to specific questions affecting a particular phase of foreign trade. Matters of procedure will be presented and discussed in these sessions. Full opportunity will be afforded here for free discussion from the floor.

One of the most useful and practical aspects of these national foreign trade conventions is the trade adviser service. Every delegate comes to these meetings with questions concerning his own business that he would like to have answered by successful foreign traders who have been themselves confronted by just such problems. This help will be given freely at this convention by a large number of foreign trade executives, who through long experience and study have become exceptionally expert in all features of their business.

The Secretary of the National Foreign Trade Council, under the auspices of which the convention will be held, is O. K. Davis, 1 Hanover Square, New York, from whom further details may be had.

Tool Builders Preparing Displays for Cleveland

Communications to the exposition committee of the National Machine Tool Builders' Association, which has the responsibility of arrangements for the National Machine Tool Builders' Exposition in Cleveland, Sept. 19 to 23, indicate a remarkable advance activity in the preparation of displays.

Although the exposition is more than six months distant, some 150 exhibitors are preparing and submitting data sheets of booth requirements for water, power, incidental accessories and special service arrangements. Several companies which will make large operating displays have had executives in Cleveland within the last few weeks examining the new West Annex of Cleveland's public auditorium.

The data sheets being submitted by exhibitors now reveal, according to the association's announcement, that the exposition will meet the earlier predictions that the Cleveland Show will be the most comprehensive showing of American machine tools ever made. This will be true by a wide margin, the association now declares, both as to range of types of machines and equipment, processes, accessories, etc., displayed and as to number and variety of purpose, size, capacity and design of each type. The association indicates that with respect to large operating units, both of standard and specialized design, the exposition will transcend any showing of industrial equipment that has even been made in the country, with the possible exception of extensive electrical, power plant or foundry equipment displays which have been shown in general expositions of the World's Fair type, and in buildings especially constructed for them.

Great Britain Patiently Awaits the Promised Industrial Revival

Trade exhibits stimulated business in some lines

BY OUR LONDON CORRESPONDENT

OPTIMISM still prevails in most manufacturing areas, although the long-awaited revival is not yet obvious. The expectation of better times persists, and is shown in the renewed claims for increased wages in the engineering industry. Both the motor and cycle and the motorcycle trades are preparing for the spring season. No decline can be reported but, on the other hand, any improvement in the home demand is not yet pronounced as it is too early in the year.

Great efforts are being made to increase the export of automobiles, and as regards cycles, both pedal and motor, many inquiries are reported from Australia, South Africa and India. It is quite likely that the coming season may form a record. These industries continue to call on the machine tool maker, but the demand for tools of the heavier type to meet the anticipated revival in the requirements of the shipyards and marine engineering works, has not materialized. This also applies to anything that may be needed for the iron and steel trades.

As regards machine tool exports, the British overseas dominions remain the best markets. The general situation hardly encourages trading in the Far East, but India is always a potential market for the British firm. New Zealand is again asking for quotations, mainly for machine tools and electrical apparatus, and although no very definite estimate has been given, it is officially stated that the orders will run into a considerable sum of money.

SHORTAGE OF STEEL

Recently new orders for shipbuilding have not been numerous, and in the face of the optimism expressed toward the end of last year, the outlook is not quite as hopeful as it seemed likely to be. But if disappointment is evident elsewhere, in more than one center the work actually in hand has increased, and complaints can still be heard of an insufficient supply of steel, due it would seem, to a shortage of pig iron, etc. The problem of prices seems to be the retarding influence.

The British Industries Fair has been held as usual in London and in Birmingham, or rather Castle Bromwich. The latter is always devoted mainly to hardware and the engineering industries. It is unquestionable that, whether as collections of exhibits or as business-producing events, these fairs have this year been more satisfactory than for some time. As is usual on the occasions of such exhibitions, highly satisfactory reports have been broadcast regarding the contracts resulting. Thus for Castle Bromwich alone, we are told that orders placed at the fair reached a total of about 4 million pounds, and a further 18 or 20 million pounds worth may be expected during the next twelve months.

Owing to the ban of the trade association, machine tools are never well represented outside the Olympia trade show, and no exception can be made of this year's Birmingham Fair. It is true that one or two machine tools were exhibited, though necessarily by firms outside the trade association. Firms in the organization may exhibit small tools, and in order to show certain cutting tools in operation one of them proposed to equip a turret or capstan lathe with such tools and accessories—a head without body or legs—to be placed on the stand. The matter was duly considered, but the decision went against any such exhibit.

RULES ARE DIFFICULT

At the British Industries Fair only products of Great Britain and the British Dominions can officially be shown. But as a result of this ban, a twist drill firm, desirous of demonstrating the penetrative effects of its product, was unable to use home-produced drilling machines for the purpose. On the stand was an American machine tool, with the name puttied and painted over. Last year, under exactly the same circumstances, a firm, to demonstrate its milling cutters, was quite unable to buy or borrow a British machine tool, even if part of its own plant, and had to have on the stand an American miller, despite the rule regarding the exhibition of British-made goods only.

Reference has been made previously in these columns to a report on mechanical engineering prepared by the trade body concerned with the International Economic Conference of the League of Nations. A similar report has just been issued on the electrical industry by the British Electrical and Allied Manufacturers' Association. To judge by the figures, the total value of the world's production of electrical goods for the year 1925 was between 595 and 600 million pounds, the total number of employees being between 1,000,000 and 1,200,000. The predominence of the United States is obvious, that country, according to the report, being "responsible for almost 50 per cent of the world's output and about 47 per cent of the world's consumption." The estimate provided is only tentative, but the figures suggest clearly enough that more than four-fifths of the total production can be ascribed to the United States, Germany and Great Britain, the worth of the production for the United States in the year stated being put at 295 million pounds, for Germany at 105 million pounds, and for Great Britain at 70 million pounds.

There are machine tool manufacturers and dealers in Great Britain who complain that they do not find in electrical firms a very ready market. The answer is that in present circumstances the electrical firms of Great Britain are doing very well financially. But some basis for the complaint will be found if we consider the value of production per person concerned in the various countries. The number of employees in the United States is put at 340,000, in Germany at 280,000, and in Great Britain at 160,000. This suggests that the annual output value per person is £870 for the United States, £437 for Great Britain, and £375 for Germany.

While Great Britain leads as an importing country, she is also first in electrical exports, the value specified being put at more than 17½ million pounds, against less than 16½ million pounds for the United States, and not quite 16 million pounds for Germany. The net consumption of electrical goods is put at about 279 million pounds for the United States, 90 million pounds for Germany, and more than 57½ million pounds for Great Britain, followed by Japan with less than 20¾ million pounds, France less than 19 million pounds, Canada more than 15¾ million pounds, Italy 14 million pounds, and Russia less than 11 million pounds. These figures give an idea of the market value of the various countries for electrical goods. The fact that the various countries tend to be self-sufficing regarding production in these matters is shown by the statement that exports generally amount to but 11.5 per cent of the total output. As regards the United States they amount to only 5 or 6 per cent while for Germany they are about 15 per cent, and for Great Britain about 25 per cent.

Machine Tool Dealers' Spring Meeting

The annual spring meeting of the Associated Machine Tool Dealers will be held at Granville, Ohio, on May 25, 26 and 27. Various matters of importance to dealers and the general routine business of the organization will make up the greater part of the three-day program. During the meeting there will be a session at which J. A. Smith, general superintendent of the Schenectady Works of the General Electric Co., and Mason Britton, vice-president and general manager of *American Machinist*, will address the members.

Wholesale Prices on Decline

Wholesale commodity prices in all important industrial countries, excepting those whose currencies are not on a gold basis, have declined consistently during the last two years, although the years 1925 and 1926 were a period of general stabilization and improvement.

This, according to the National Industrial Conference Board, parallels to an extent the experience in the United States during 1925 and 1926, when American industry was confronted with the novel phenomenon of declining commodity prices during a period of increasing industrial activity.

While many different factors enter into price fluctuation, the practically uniform lower world price trend during a period of general improvement reflects generally greater economy in production and by that token augurs well for the immediate future of world business conditions.

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry

By THEODORE H. PRICE
Editor, Commerce and Finance, New York

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EARLY in the eighteenth century a speculative craze swept over England. The public appetite for new securities seemed insatiable and companies for almost every conceivable purpose were organized. Eighty-six of the companies formed during this period are listed in a book published in London in 1852. It is called "Extraordinary Popular Delusions."

The writer was reminded of this list by the advertisements of recently formed companies that are now to be found in the daily papers. Most of these companies are sponsored by respectable bankers and it is to be presumed that the securities offered are sound. But digestion precedes assimilation, and the processes of metabolism are sometimes punctuated and retarded by periods of indigestion.

This is true of the body financial as well as of the body physical and it is about the only comment that needs to be made upon the security markets of last week. They were fitfully strong under the stimulus of easy money and the success of Secretary Mellon's refunding operations. As long as money to buy and carry seasoned stocks can be obtained for less than the dividends they pay they may show recurrent resiliency. The advance with which such stocks greeted 3½ per cent call loans last Wednesday showed to what extent the high prices are sustained upon a foundation of credit. Nevertheless credit is a fluid and it is important to watch its flow, for stocks cannot advance forever.

Therefore, the fact that brokers loans are advancing steadily toward the peak reached last March, and at the last report date were higher than in any week since then, has impressed itself upon a speculative consciousness made sensitive by the anniversary of the severe break in stocks a year ago. Not a few feel that this alone is a signal to proceed only half speed ahead and stand by to reverse. Otherwise it must be admitted that the bank statements indicate a continued abundance of loanable funds at low rates, and nothing to force liquidation is in sight unless and until commercial demand expands. The Federal Reserve Banks' report of last Thursday showed that bills discounted for member banks totaled only $330,000,000 which is the lowest since the fall of 1924. Obviously this indebtedness is being paid off only because more profitable employment for the money borrowed cannot be found.

But while money can hold securities relatively dear through its own cheapness it can not, except in a limited sense, make profits for industry, increase the volume of trade, uphold commodity prices when surplus supplies exist, nor effect rail consolidations whereby all the little roads that have been bid up on hope can be allied to larger and richer ones. The activity and equilibrium of commerce and industry must be judged by itself alone, and our system of mass production is by its very nature compelled to steer between the Scylla of excess output, when running at full speed, and the Charybdis of rising overhead costs and declining profits when running more slowly. For investors the latter is now the more dangerous risk.

The facts, however, are hard to get at and the information contradictory. Trade is spotted but entirely satisfactory to all who accept the fact that even in the United States an occasional year must slip by without breaking records. Bank clearings are running a little below last year and so are car loadings if the temporary gains in coal, which will cease April 1, are deducted.

On the other hand the automobile companies, with the exception of Ford and one or two others, report capacity operations and sales heavy enough to absorb their output, and when its new models are introduced the Ford Co. is expected to join the prosperity parade. The industry's first quarter was at least 10 per cent below last year. Its recently expanded activity is helping the steel companies; their prices are firmer and their output has been increased again to approximately 90 per cent of capacity. It is said, however, that this production exceeds demand and that stocks are being accumulated against a possible interruption caused by the coming coal strike, wherefore some slowing down during April may occur. The coal strike is attracting less attention than almost any other industrial dispute of equal magnitude in our history.

This industrial review presents little that is specifically discouraging, though there is no hint of a boom and the level of activity upon the whole is good.

Some of the specific news of the week is quite cheerful as a reflection of individual prosperity. February life insurance sales were 2.8 per cent larger than a year ago. Our foreign trade for the same month showed a gain of $20,000,000 in exports and a decline of $75,000,000 in imports as compared with February, 1926. Such a balance seems paradoxical in a nation that is owed by the whole world, but it is accounted for by the billions that we are lending and spending abroad each year. And finally the payment of $600,000,000 in income tax payments March 15, a direct index of individual prosperity though one that we would gladly dispense with, exceeds the total of a year ago by an astounding amount.

WHAT'S DOING IN INDUSTRY

THE TREND of machinery and machine tool business this month gives the impression that the expected spring improvement is about to begin. From more than one important industrial center comes the report that sales have increased and the volume of inquiries, many calling for quick delivery, leads to the belief that equipment needs are urgent and that users are prepared to buy to fill these needs.

CHICAGO reports a perceptible improvement, bringing a gradual increase in orders. Better condition in the automobile industry have caused an upturn in sales in Detroit. A temporary sales slump has hit Cincinnati, but inquiries indicate an early recovery. Automobile and body plants have provided some good business in the Indiana territory.

CANADIAN machinery dealers look for a continuance of the good business that has prevailed there since the first of the year. The outlook in New England continues to improve, manufacturers being busy on current orders. Business in the Southern district is fair, with conservatism ruling the buying of new equipment.

GENERAL trade all over the country is spotty but entirely satisfactory to all who accept the fact that even in the United States an occasional year must slide by without breaking records.

The Industrial Review

Weekly progress of the machinery and machine tool business

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

CHICAGO

Within the last week there has developed a perceptible improvement in the machine tool industry, and present indications point to an increased volume of business on a slowly ascending scale. In point of sales, there have been a number of transactions involving purchases of new machinery of considerable importance.

The demand for used tools is being fairly well maintained, prices averaging somewhat higher than for some time past. This was in evidence at some recent receivers' sales of machine tool equipment at which were sold a number of standard tools at figures considerably in advance of those ordinarily charged by dealers.

Railroads are showing more interest in the machinery market than for some months, and are regarded as the best prospective customers for several weeks to come. Among the roads having issued lists the Santa Fe and the E. J. & E. are the principal factors. It is reported that the Union Pacific has completed its 1927 budget, and that it will soon be in the market with a list of some magnitude.

INDIANAPOLIS

While slight expansion continues to feature the local machinery and machine tool trade, there appear some spots in business which will have to be eradicated before the volume assumes satisfactory proportions. Demand for machinery specially designed for coal mines has slumped during the past two weeks as the prospects for a strike become more pronounced. Railroad buying is not what was expected the first of the year.

Demand from automobile plants continues good, with every prospect of a continued volume for the next few weeks. All the Indiana factories are working nearly to capacity and report bright prospects for the remainder of the year. Their buying, in view of the rate of their production, is hardly what was expected, but it is of a satisfactory volume as compared with demand from other industrials.

Special machinery for the automobile body plants also is selling readily. These plants seem more busy than the automobile factories themselves and are buying in some measure to anticipate future needs.

CINCINNATI

A somewhat inactive market during the past week is reported by the majority of the machine tool manufacturers in the Cincinnati district, but there are some who report that they made a slight gain in sales. Selling agents report that they did a little better than in the previous week and feel that in their territory market conditions are improving.

The week's bookings were largely confined to single tools and replacements, the orders coming from all sections of the country and calling for all sizes and types of tools. A number of these single purchases were made for try-out purposes, with a view to buying more. The Missouri-Pacific bought several tools, and a few single orders were received from other railroads. Concerns in the automobile field confined their purchases to single tools and replacements, but reports received indicate that this industry is preparing lists and soon will order in a large way.

The many and well-diversified inquiries that came from all sections of the country during the week are taken as an indication that the past week's lull is merely a temporary matter, and that the market is about to become livelier.

The only unfavorable condition on the horizon is the impending strike in union coal fields, but the concensus is that if this takes place it will not disrupt business to any extent.

DETROIT

Sales charts for machinery and machine tools in Detroit and other automotive centers in southeastern Michigan will show March as one of the two peaks of the year, according to leading machine tool dealers, although the peak will not be as high as during March last year, or March of 1925.

Business seems to have picked up considerably, and instead of being pessimistic over the outlook, representatives are viewing the future with more confidence. The early spring has lead to more buying of automobiles and this is reflected in more purchases of equipment. Employment is improving, in spite of layoffs at a few isolated plants.

A factor in the more optimistic outlook is the fact that every motor car plant is strengthening its line. Orders for special machines have been reported from seven manufacturers during the past week. The Oakland Motor Car Co. is buying more than any other at present. This machinery is for the new motor which is expected to be in production in May.

A résumé of the past three months follows very closely the forecasts of leading machinery dealers. They were in agreement that the year would start slowly but would gradually improve. This has followed when the sales charts are analyzed, and prospects are for considerable more buying during the second quarter than during the first quarter.

CANADA

The metal working industry in Canada faces the second quarter this year in a much better position and much better spirits than for some time past. Machine tool dealers look for a continuation of the good business they have been experiencing since the beginning of the year. The pulp and paper and power development fields are expected to produce a considerable amount of second and third quarter business. Then too, the increased activity in the mining fields of northern Quebec and Ontario is sure to result in heavy demands for machinery and tools during the summer.

Foundries and other metal working plants are now reaping the benefit of the orders placed by the Canadian National Railways. While the Canadian Pacific Ry. may not place new locomotive business, it has been announced that the company will rebuild a large number of locomotives at the Angus shops, which will require considerable material. The National Railways recently placed an order with the Eastern Car Co. for 15 snow plows, 200 refrigerator cars and 200 automobile cars.

The operations of the Dominion Bridge Co. are being maintained at a level considerably higher than has existed for many years. President T. A. Russell of the Canadian Acme Screw and Gear, Ltd., reports that his firm is shipping large quantities of machinery and tools into the mining districts of Ontario and Quebec.

NEW ENGLAND

Manufacturers of machinery and tools in the Connecticut section of New England are practically unanimous in declaring that the business outlook continues to improve. A canvas of manufacturers leads to the conclusion that the first three months of 1927 will be equal, and in many instances better, than a year ago, so far as profits are concerned. There was more buying of single units, according to the experience of big machinery producers during the past two weeks, and early deliveries were specified, indicating urgency. There is an indication in the tone of inquiry business that immediate shipment is a fixed requirement, and while few manufacturers are undertaking production far in excess of actual business some are giving the subject of stocking serious consideration.

Production machinery is in good demand for export deliveries, but this class of trade is more or less spotty. Manufacturers engaged in production for the automotive trade are operating on full time schedules, especially in Bristol and New Britain.

SOUTHERN DISTRICT

Though machinery and tool business in the Southern district is fairly good at this time, sales are not yet showing the improvement the dealers had expected, most of the present buying being on a rather conservative basis. The inquiry, however, continues very good, and dealers feel confident that sales will soon begin to show an upward trend.

There is fair buying by smaller shops and garages, and automotive service stations, but as has been the case for some time a majority of the orders are for used or rebuilt equipment with comparatively little business being received for new equipment. Sales are not as active as they were at this time last year.

The textile industry is not buying as heavily as had been expected at this time, but is none the less active and should continue so through the spring and summer due to the large amount of new mill construction in progress in this territory.

There is some buying of heavier equipment reported by the railroads, with the inquiry is brisk and at least a normal business is in prospect for the next few months.

NEW YORK

A slightly better tone has come into this market in the past ten days. The volume of sales has not increased, but there has been a marked improvement in the number of inquiries and in the demand for immediate shipment. This leads local dealers and agents to believe that lists that were held up for a period last month have been released and that the expected spring business is about to arrive.

Inquiries from railroads for small tools and miscellaneous supplies has shown improvement. Export demand is quiet.

Among the orders made public last week were those for the following tools: 2 jig borers, an automatic worm grinder, a vertical drill press, two 13-in. lathes, two 16-in. lathes, 2 bench millers, 2 hand millers, a tapping machine, a floor grinder, and a vertical shaper.

Southern States Entering a Period of Vast Foreign Trade Expansion

Dr. Klein predicts prosperous future

IN AN address before the Southeastern Foreign Trade Conference on March 17, Dr. Julius Klein, director of the Bureau of Foreign and Domestic Commerce of the Department of Commerce, declared that the South is on the eve of a vast expansion of her foreign trade, this expansion being fostered by the introduction of a diversification of business through increased sales of fabricated wares. The subject of Dr. Klein's address was "The Foreign Trade of the New South," and in it he traced the development of agriculture and manufacture in the past decade. He called attention to the economic awakening of the Southern states in recent years and predicted a prosperous future for those industries that would keep abreast of the present forward movement.

An Opportune Time

"The astounding economic awakening of the Southern states needs no demonstration," he said. "It is familiar to every observer of the progress of our country in recent years. Viewed from the angle of foreign trade, the significant fact is that this almost revolutionary renaissance in Southern industries and trade is coming to a head at a peculiarly opportune moment in the development of international commerce as a whole. The trade of the world has been entirely remade within the last decade. A totally new set of commercial factors has come into being which make any talk of returning to 'pre-war normalcy' the emptiest of antiquarian twaddle. Even if it were desirable to revert to pre-1914 commercial mediaevalism, it would be impossible in the face of the drastic changes in trade routes in all directions, the unbelievable improvements in fiscal and credit machinery, the miracles of the new communication facilities—radio, air traffic, diesel-motored shipping, and the entirely new industries brought into being during and after the war, with consequent spectacular changes in the standards of living and buying power among vast populations beyond the seas.

"To capitalize the multitude of commercial advantages which have risen with these far-flung, profound changes there is required first of all a quick readiness and ability to readjust production and distribution methods. Such an alert, elastic capacity is not easy to find in an older commercial organism; it is essentially inherent, however, in youthful, dynamic industrial and trade communities. There is no part of the United States to which these terms can be more justly applied than to the amazing new commercial life of the South, which thus finds herself in a position of peculiar advantage as she looks out over the horizon toward the great competitive markets of the world.

"It is not generally realized that the value of the manufactures and minerals produced in the South are double the value of its agricultural products. As was vividly pointed out in a recent tabulation, the output of the two former groups exceeded eleven billion dollars in 1923, as against an agricultural and live stock value in 1925 of some $4,855,000,000; and the rapidly mounting values of Southern manufactures since 1923 have considerably widened this discrepancy. Every Southern state shows a higher value for manufactures and minerals produced than for farm products, except Mississippi and Arkansas. Indispensable as her farm products are, both to herself, to the nation, and to the world at large, the South is, nevertheless, by no means an exclusively agricultural area, much less a one-crop country.

"It has, therefore, a large and rapidly increasing interest in the trend of our exports in the direction of fabricated wares. Whereas during the five years 1910-14 our annual exports of finished manufactures averaged about 30 per cent of our total over sea sales, during 1926 they contributed nearly 42 per cent. Their average annual value during the half decade just before the war was $654,000,000, whereas last year it was nearly two billion dollars.

"Nearly 40 per cent of the export tonnage of the United States moved out of Southern ports last year. In this connnection I might call attention to the formidable increase in the total tonnage (export as well as intercoastal) of the Southern ports during the last few years; it rose from sixty million tons in 1923 to eighty-two million tons in 1925, an increase of 38 per cent. This means vastly improved port facilities and ship services in general, which play such a vital part in economical and efficient exporting."

Referring directly to the South's products, Dr. Klein said: "Birmingham is our leading source of export steel rails. Quantities of canton flannel manufactured in Southern mills are now finding their way to the Far East through the Panama Canal. More than four million yards of Southern cotton duck go abroad each year, largely to England, which is something like 'carrying coals to Newcastle.' The South, notably Atlanta, is contributing an increasing proportion of our shoe exports, 50 per cent of which now go to your neighbor, Cuba. The skis, which figure so conspicuously in the winter sports of Switzerland, originate, in large part, in Memphis. The trade in trucks in the important nitrate area of northern Chile is largely supplied by one Texas manufacturer. The dairy industry of Denmark is dependent to no small degree upon the South for certain types of high-grade processed cattle foods. Similar instances could be multiplied almost without end to illustrate the alert resourcefulness with which enterprising Southern merchants and manufacturers have capitalized the opportunities that are developing overseas in rapidly increasing numbers for their commodities."

In conclusion he said: "There is every evidence that the South is on the eve of a vast expansion of her foreign trade, not so much along the old lines of passive raw material distribution, but rather by the introduction of a healthy diversification through increased sales of fabricated wares. In the readiness and alert resourcefulness of her new industries in meeting new problems, in a multitude of her supplies of necessary raw materials, in the abundance of her water-power and fuel, in the up-to-date equipment of her many ports, and in her proximity to nearby markets and to well traveled sea-lanes leading to others of vast potentiality, she enjoys a combination of advantages that are unique and of compelling power."

A. S. T. M. Program for Thirtieth Meeting

Details of the program for the thirtieth annual meeting of the American Society for Testing Materials, to be held at French Lick, Ind., June 20 to 24 are now being developed by the committee on papers and publications. The value of the reports and papers and their timely interest will be fully up to the standard. The committees have been quite active and most of them will have reports to present to the convention. The papers that have been accepted are of extreme interest, including, so far as metals are concerned, papers on fatigue testing and on the testing of thin sheet metals. There are a number of papers on instruments and methods of test including the spectrograph as a laboratory tool.

The papers presented at the 1926 annual meeting have been reviewed by the special committee, and the first award of the Charles B. Dudley Medal will be made at the meeting. The award is made to the author of a paper of outstanding merit constituting an original contribution on research in engineering materials.

The Edgar Marburg Lecture will again be a feature of the program and a special session will probably be devoted to it. The selection of the lecturer by the committee will be announced later.

This annual meeting represents the twenty-fifth anniversary of the incorporation of the society. This will be suitably observed by holding an anniversary dinner arranged by the committee on annual meetings, consisting of K. G. Mackenzie, chairman, Louis Anderson, E. F. Kenney and W. B. Price. Appropriate recognition will be made of those members who have been continuously members of the society since its incorporation.

In addition to the annual golf and tennis tournaments, the committee is planning a number of entertainment features, particularly for the ladies attending the meeting.

The committee is formulating plans to assist the members of the society in making their journey to and from French Lick. Special through sleeping car service will be arranged from many sections of the country, wherever a sufficient number of members plan to attend the meeting from a given locality.

Personals

R. J. GOLDIE has been appointed assistant general manager and director of sales for the Nice Ball Bearing Co., of Philadelphia.

HARRY HARTZ is now associated with the experimental and research department of the Studebaker Corporation of America.

L. C. WILSON has been appointed sales representative in the Pittsburgh district for the Brown Instrument Co., of Philadelphia.

HARRY MINER, who represents the Landis Tool Co., in Paris, France, is visiting in the United States.

GEORGE R. WHITE, who has been representing the Manning Abrasive Co. in the Chicago territory, has been transferred to the company's home plant at Troy, N. Y.

D. J. BRUMLEY, engineer for the Illinois Central R.R., has been elected president of the American Railway Engineering Association.

E. G. BLACK has again become consulting engineer for the American Manganese Steel Co., in Chicago. A. H. Exton has become chief engineer.

H. A. MOORE has been appointed general sales manager for the Foster Machine Co., of Elkhart, Ind. He was formerly sales manager for the High Speed Hammer Co., of Rochester, N. Y.

G. N. BULL has been appointed district sales manager in the New York office of the Lincoln Electric Co., of Cleveland. He was formerly with the Worthington Pump and Machinery Co., at Washington, D. C.

PROF. J. W. ROE, of New York University, has been decorated with the Order of the White Lion, an honorary award of the Czechs and bestowed by the Masaryk Academy of Prague.

C. P. KRAMER has resigned from the Chicago Division of the National Acme Co., and will establish a business of his own. He has secured a factory at 4554 W. Congress St., Chicago, and will manufacture screw machine products.

P. A. HAWLEY, R. W. BLANCHARD and STANLEY HART have been added to the board of directors of the Hart & Cooley Co., Inc., of New Britain, Conn. Howard S. Hart is chairman of the board and Norman P. Cooley is president and treasurer.

E. H. COOPER has been re-elected chairman of the board of the Fafnir Bearing Co., of New Britain, Conn. Other officers re-elected were: Maurice Stanley, president; R. R. Searle, vice-president; R. N. Hemingway, vice-president; A. G. Way, secretary and treasurer. C. F. Stanley is assistant secretary.

GEORGE C. WISEMAN, of Cleveland, has been appointed district representative in the new Hodell Tire Chain Sales and Service Station established by the Chain Products Co. in Cleveland. Mr. Wiseman was formerly with the P. A. Geier Co., of Cleveland, as special representative on tools and machinery.

JOHN F. BARR, of New York, has joined the Chain Products Co., of Cleveland, as export manager for the company and its associated industries, the Van Dorn Electric Tool Co. and Van Dorn & Dutton Co. Mr. Barr was formerly with Sargent & Co., hardware manufacturers, and for two years was stationed in Buenos Aires, South America.

H. M. HORLDT and W. G. BIHLER, formerly of the Horby Engineering Co., of Hartford, Conn., have just returned from a business trip to Europe. They have opened an office under the name Horldt & Bihler, mechanical engineers, Thompson Bldg., Providence, R. I. They will specialize in the design of automatic machinery, dies, jigs and fixtures.

WILLIAM G. ZANGLEIN has been appointed sales production manager of the Monroe Calculating Machine Co., Inc., of Orange, N. J. Mr. Zenglein joined the Monroe sales organization in December, 1920, and was promoted to local manager at Rochester, N. Y., in 1922. Later he was made special sales representative for the Northeastern sales division and worked in New York, New England and Pennsylvania.

DAVID E. ROSS has retired from active duty as a member of the Ross Gear and Tool Co., Lafayette, Ind. In effecting a reorganization, D. L. Ross is resigning as president and treasurer to become chairman of the board of directors. Edward A. Ross is to be the new president, and the board of directors will consist of D. L. Ross, Edward A. Ross, Eugene Gruenwald, F. F. Chandler, H. A. Dick, Arthur F. Kanne and Roy M. Reser.

Business Items

The Goss & DeLeeuw Manufacturing Co., of New Britain, Conn., has moved into its new plant and production has been placed in full swing.

The Columbus-McKinnon Chain Co., of Columbus, Ohio, has opened an Eastern sales office at 2619 Grand Central Terminal Bldg., New York. This office is in charge of William Koch.

The Skinner Chuck Co., of New Britain, Conn., announces the appointment of Karl Lehnhardt as sales representative in the New York and surrounding territory. The company's New York office will be located at 86 Warren St., where a complete stock of chucks will be carried.

The Lincoln Electric Co., of Cleveland, announces the following changes in the personnel of its sales organization: C. S. Freeman, formerly in charge of the Lancaster office has been transferred to Buffalo. S. W. Shultz of Philadelphia, has been placed in charge at Lancaster. E. J. Pfister has been transferred from Buffalo to the Philadelphia office.

Stedfast & Roulston, Inc., will, on April first, take over and continue the business of Hill, Clarke & Co., Inc., of Boston, as successors. A corporation has been formed with the following officers: A. R. Stedfast, president; J. W. Roulston, vice-president; E. A. Nye, treasurer. A. R. Stedfast and J. W. Roulston are well-known in the machinery trade, having been associated with Hill, Clarke & Co. for over forty years. E. A. Nye has been with the original company for fifteen years. They will continue to specialize in high grade machine tools, representing several prominent manufacturers in New England. The company's address will remain the same and the sales force will continue in the old territories.

Obituaries

H. W. KEARNS, founder of H. W. Kearns & Co., Ltd., Broadhearth, near Manchester, makers of machine tools, died recently.

ALFRED H. WEHMILLER, president of the Barry-Wehmiller Machinery Co., of St. Louis, died in that city on Feb. 3.

JOHN W. SMITH, president of the Muncie Oil Engine Co., of Muncie, Ind., died recently at his home following a short illness.

E. A. SAVAGE, joint managing director of Buck & Hickman, Ltd., Whitechapel, London, E., importers of American machine tools, etc., died recently, aged 48 years.

FRANK K. BULL, formerly chairman of the board of the J. I. Case Threshing Machine Co., and president of the Milwaukee Harvester Co., died in Los Angeles on March 13. He was 70 years old.

JOHN W. MURRAY, chairman of the board of directors of the J. W. Murray Manufacturing Co., and a member of the executive committee of the Murray Corporation of America, died at his home in Detroit on March 11. Mr. Murray was 69 years old.

HARRY W. CHAMPION, vice-president of the Consolidated Machine Tool Corporation of America, and for many years a prominent figure in the machinery industry, died at his home in Philadelphia on March 13. Mr. Champion was president of the Newton Machine Tool Co., of Philadelphia, and became a vice-president of the Consolidated when the companies were merged several years ago. Mr. Champion was 62 years old.

Forthcoming Meetings

American Society of Mechanical Engineers. Regional meeting, Kansas City, Mo., April 4 to 6. C. E. Davies, secretary in charge of meetings, 29 West 39th St., New York.

American Gear Manufacturers Association. Eleventh annual meeting, Hayes Hotel, Jackson, Mich., May 12 to 14. T. W. Owen, secretary, 2443 Prospect Ave., Cleveland, Ohio.

American Society for Steel Treating. Spring sectional meeting, Milwaukee, Wis., May 19 and 20. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

American Society of Mechanical Engineers. Semi-annual meeting, White Sulphur Springs, W. Va., May 23 to 26. C. E. Davies, secretary in charge of meetings, 29 West 39th St., New York.

Associated Machine Tool Dealers. Annual spring meeting at Granville, Ohio, May 25, 26 and 27. Tyler W. Carlisle, secretary, the Strong, Carlisle & Hammond Co., 1392 West Third St., Cleveland, Ohio.

National Foreign Trade Council. Fourteenth national foreign trade convention, Hotel Statler, Detroit, Mich., May 25, 26 and 27. O. K. Davis, secretary, India House, Hanover Square, New York.

Society of Industrial Engineers. Annual meeting, Hotel Stevens, Chicago, May 25, 26 and 27. George C. Dent, secretary, 608 S. Dearborn St., Chicago, Ill.

Society of Automotive Engineers. Summer meeting, French Lick Springs, Ind., May 25 to 28. C. E. Heywood, manager of meetings department, 29 W. 39th St., New York City.

American Foundrymen's Association. Annual convention, Edgewater Beach, Chicago, June 6 to 10. R. E. Kennedy, secretary, 909 W. California St., Urbana, Ill.

National Supply and Machinery Distributors' Association. Twenty-second annual convention with the **Southern Supply and Machinery Dealers' Association**, and the **American Supply and Machinery Manufacturers' Association**, on board the steamship *Noronic*. Boat leaves Detroit, Mich., June 13 and returns there June 17. George A. Fernley, secretary, 505 Arch St., Philadelphia.

American Society for Testing Materials. Annual meeting at French Lick, Ind., June 20 to 24. C. L. Warwick, secretary, 1315 Spruce St., Philadelphia.

American Railway Tool Foremen's Association. Fifteenth annual meeting, Hotel Sherman, Chicago, Aug. 31, Sept. 1 and 2. G. G. Macina, secretary, 11,402 Calumet Ave., Chicago.

American Society for Steel Treating. Ninth annual convention and national steel exposition, Detroit, week of Sept. 19. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland.

Machine Tool Exhibit. Seventh annual machine tool exhibition under the auspices of the New Haven Section of the American Society of Mechanical Engineers, the Department of Mechanical Engineering of Sheffield Scientific School, Yale University, and the Chamber of Commerce of New Haven: At the Mason Laboratory, Yale University, Sept. 6 to 9. Harry R. Westcott, chairman of the exhibit committee, 400 Temple St., New Haven, Conn.

National Machine Tool Builders' Association. First exposition of machine tools at the Public Auditorium, Cleveland, Ohio, Sept. 19 to 24. J. Wallace Carrel, vice-president and general manager, the Lodge & Shipley Machine Tool Co., Cincinnati, Ohio, chairman of the exposition committee. Ernest F. DuBrul, general manager of the association, 826 Provident Bank Bldg., Cincinnati. Roberts Everett, manager of the exposition, 1328 Broadway, New York City.

The Weekly Price Guide

Rise and Fall of the Market

FUEL prices show no tendency to rise abruptly despite the impending strike in bituminous mines. Reserve fuel stocks will cover two to three months requirements in most of the basic industries. Steel stocks at mills and warehouses are limited; prices, therefore, may be expected to develop increasing firmness. Steel demand, at present, runs largely to structurals, automotive and agricultural machinery material; railway steel is slower. Declines of the week comprised black sheets, non-ferrous metals and washed, white wiping cloths. No advances of consequence occurred. Bars are $1.90@$2 per 100 lb., at Pittsburgh mill, with plates, $1.80@$1.90 and shapes, $1.90 per 100 lb. The last mentioned are reported, in some quarters, as low as $1.70@$1.80 per 100 lb., f.o.b. mill.

(All prices as of Mar. 18)

IRON AND STEEL

PIG IRON—Per gross ton, f.o.b.:

CINCINNATI	
No. 2 Southern	$22.19
Northern Basic	20.89
Southern Ohio No. 2	21.19
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	26.37
BIRMINGHAM	
No. 2 Foundry	18.50
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	22.76
Virginia No. 2	27.17
Basic	21.76
CHICAGO	
No. 2 Foundry local	21.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	23.55
PITTSBURGH, including freight charge ($1.76) from Valley	
No. 2 Foundry	20.26
Basic	19.76
Bessemer	21.26

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.00@4.50
Cleveland	5.00@5.25
Cincinnati	5.00@5.50
New York	5.25@5.50
Chicago	4.75@5.25

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	Chicago	Cleveland	New York
No. 10	2.20@2.25	3.50	3.25	3.89
No. 12	2.25@2.30	3.55	3.30	3.94
No. 14	2.30@2.35	3.60	3.35	3.99
No. 16	2.40@2.45	3.70	3.45	4.09
Black				
Nos. 18 to 20	2.60@2.70	3.75	3.25	4.15
No. 22	2.75@2.85	3.90	3.40	4.30
No. 24	2.80@2.90	3.95	3.45	4.35
No. 26	2.90@3.00	4.05	3.55	4.45
No. 28	3.05@3.15	4.20	4.70	4.60
Galvanized				
No. 10	2.95@3.05	4.10	3.95	4.40
Nos. 12 to 14	3.05@3.15	4.20	4.05	4.50
No. 16	3.15@3.25	4.30	4.15	4.60
No. 18	3.30@3.40	4.45	4.30	4.75
No. 20	3.45@3.55	4.60	4.45	4.90
No. 22	3.50@3.60	4.65	4.50	4.95
No. 24	3.65@3.75	4.80	4.65	5.10
No. 26	3.85@3.95	5.05	4.90	5.35
No. 28	4.10@4.20	5.30	5.15	5.60

WELDED STEEL PIPE—Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	53%	39%	55½%	43½%	54%	41%
2½ to 6 in. steel lap welded	48%	35%	53½%	40½%	51%	38%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4% less 5%. Cast iron, standard sizes, 36-5% off.

Size, Inches	List Price per Foot	Diameter in Inches — External	Diameter in Inches — Internal	Thickness Inches
1	$0.17	1.315	1.049	.133
1¼	.23	1.66	1.38	.14
1½	.27½	1.9	1.61	.145
2	.37	2.375	2.067	.154
2½	.58½	2.875	2.469	.203
3	.76½	3.5	3.068	.216
3½	.92	4.0	3.548	.226
4	1.09	4.5	4.026	.237
4½	1.27	5.0	4.506	.247
5	1.48	5.563	5.047	.258
6	1.92	6.625	6.065	.28

SEAMLESS STEEL TUBING—Following net prices are for seamless mechanical tubing, cold drawn, round, .10 to .30 carbon, at warehouse in lots of less than 100 ft.:

Thickness — Decimal	B.W.G. and Fractions	Outside Diameter in Inches — ¼	⅜	½	⅝	1	1½	1½
		Price per Foot						
.035"	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23
.049"	18	.17	.18	.19	.20	.21	.23	.25
.065"	16	.19	.20	.21	.22	.23	.25	.27
.083"	14	.20	.22	.23	.24	.25	.27	.29
.095"	13	.21	.23	.25	.26	.27	.29	.31
.109"	12	.22	.24	.26	.27	.28	.30	.32
.120" or .125"	11	.23	.25	.27	.28	.29	.31	.33
134"	10	.24	.26	.28	.29	.30	.32	.34

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Spring steel (light) (base)*	4.50	6.00@7.50	4.65
Spring steel (heavier)	4.00	....	4.00
Coppered Bessemer rods (base)	6.05	6.00	6.20
Hoop steel	4.49	3.65	4.15
Cold rolled strip steel	6.25	6.35	6.25
Floor plates	5.25	5.30	5.00
Cold drawn shafting or screw	4.00	3.90	3.60
Cold drawn flats, squares	4.50	4.40	4.10
Structural shapes (base)	3.34	3.10	3.10
Soft steel bars (base)	3.24	3.00	3.00
Soft steel bar shapes (base)	3.24	3.00	3.00
Soft steel bands (base)	3.99	3.20	3.65
Tank plates (base)	3.34	3.20	3.10
Bar iron (2.90@3.00 at mill)	3.24	3.21	3.00
Drill rod (from list)	60%	55%	50%

Electric welding wire, New York, ⅛", 8.35c.; ¼", 7.85c.; ⅜" to ½", 7.35c. per lb. *Flat, ⅛@¼-in. thick.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			14.62½
Tin, 5-ton lots, New York			71.25
Lead (up to carlots) E. St. Louis	7.40	New York	8.25
Zinc (up to carlots) E. St. Louis	6.70	New York	7.62½

	New York	Cleveland	Chicago
Antimony (Chinese) ton spot	15.50	18.50	16.25
Copper sheets, base	22.00	22.00	22.00
Copper wire, base	18.87½	18.87½	15.37½
Copper bars, base	21.62½	21.62½	21.62½
Copper tubing, base	24.00	24.00	24.00
Brass sheets, high, base	18.37½	18.37½	18.37½
Brass tubing, high, base	23.25	23.25	22.75
Brass rods, high, base	16.12½	16.12½	16.12½
Brass wire, high, base	18.87½	18.87½	18.87½

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminium ingots, 98 to 99%, 1 to 15 ton lots	26.00	26@27	26 02
Zinc sheets (casks)	13.00	12 30	11 36
Solder (½ and ½), (case lots)	42.50	43.75	38½@42½

Babbitt metal, delivered, New York, cents per lb.:

Genuine, highest grade	88.00
Commercial genuine, intermediate grade	61.00
Anti-friction metal, general service	31.50
No. 4 babbitt (f.o.b.)	13.50

Nickel, f.o.b. refinery, cents per lb.:

Ingots	35.00	Electrolytic	39.00
Shot			36.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Hot rolled nickel sheet (base)	52.00
Cold rolled nickel sheet (base)	60.00
Hot rolled rods, Grade "A" (base)	50.00
Cold drawn rods, Grade "A" (base)	58.00

Base price of Monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	35.00
Blocks	32.00	Cold drawn rods (base)	43.00
Cold rolled sheets (base)	50.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Crucible heavy copper	11.50 @11.75	10.75	10.75@11.25
Copper, heavy, and wire	10.75 @11.25	11.00	9.75@10.25
Copper, light, and bottoms	9.50 @10 00	9.50	8.75@ 9 25
Heavy lead	6.50 @ 7 00	6.25	6.00@ 6 50
Tea lead	5.25 @ 5.50	4.25	4.75@ 5.25
Brass, heavy, yellow	7.25 @ 7.50	7.50	6.75@ 7.25
Brass, heavy, red	9.25 @ 9.75	9.50	9.00@ 9.50
Brass, light	5.50 @ 6.00	6.00	6.00@ 6.50
No. 1 yellow rod turnings	7.50 @ 8.00	7.50	7.00@ 7.50
Zinc	4.25 @ 4.50	4.00	3.25@ 3.75

TIN PLATES—Charcoal—Bright—Per box

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	14x20	$12.10	$11.95	$11.50
"A" Grade:				
IC,	14x20	9.70	9.90	9 50
Coke Plates—Primes—Per box				
100-lb.,	14x20	6.45	6.10	7.00
Terne Plates—Small lots, 8-lb. Coating—Per box				
IC,	14x20	7.75@8.00	7.00	7.50

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.13@0.17½	$0.16	$0.15@0.20
Cotton waste, colored, per lb.	.09@ .13	.12	.12@.17
Wiping cloths, washed white, per lb	.15½@.17½	36.00 per M	.15
Sal soda, per 175 lb. keg	2.80	2.75	2.75
Roll sulphur, per lb	.04	.03½	.04
Linseed oil, per 7½-lb. gal., 5 bbl. lots	81½	.98	80
Lard cutting oil, 25% lard, in 5 gal. cans, per gal.	55	.50	.50
Machine oil, medium-bodied (55 gal. metal bbl.), per gal.	33	.35	29
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin. ft per inch of width for single ply.			
Medium grade	40–5%	40–5%	40–5%
Heavy grade	30–10%	30–10%	30–10%
Rubber transmission, 6-in., 6 ply, $1.83 per lin. ft.			
First grade	50%	50–10%	50%
Second grade	50–5%	60–5%	50–10%

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0324	$0.0324	$0.0324
Cold drawn shafting	per lb.	.04	.04	.04
Brass rods	per lb	.1612½	.1562½	.1687½
Solder (½ and ½)	per lb.	425	.42	.4025
Cotton waste	per lb.	.13@17½	13@.17½	.15@.22
Washers, cast iron (½ in.)	per 100 lb.	7.00	7.00	7.00
Emery disks, cloth, No. 1, 6 in. dia.	per 100	3.10	3.10	3.55
Lard cutting oil	per gal.	55	.55	55
Machine oil	per gal.	33	33	35
Belting, leather, medium	off list	40–5%	40–5%	40–5%
Machine bolts, up to 1x30 in.	off list	40%	40%	40%

MISCELLANEOUS—Continued

	New York	Cleveland	Chicago
Abrasive materials—In sheets 9x11 in., No. 1 grade, per ream of 480 sheets:			
Flint paper	$5.13*	$4.95	$5.13
Emery paper	10.71*	9.15	10.71
Emery cloth	27.84*	27.85	27.84
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1.29	1.27	1.32
Cloth	3.10	3.05	3.05
Fire clay, per 100 lb. bag		.75	.75
Coke, prompt furnace, per net ton	Connellsville,		3.50@3.75
Coke, prompt foundry, per net ton	Connellsville,		4.50@5.00
White lead, dry or in oil, 100 lb. kegs	New York,		15.25
Red lead, dry, 100 lb. kegs	New York,		15.25
Red lead, in oil, 100 lb. kegs	New York,		16 75

*4½ reams and under.

SHOP SUPPLIES

Machine bolts, ¼x1½-in., per 100, $1.70. Discount at New York warehouses on all sizes up to 1x30-in., 40%; 1½ and 1¼x3-in. up to 12-in., 15%; with cold punched hex. nuts up to 1-in. dia. (plus std. extra of 10%) 30%; with hot pressed hex. nuts up to 1x30-in. (plus std. extra of 10%) 35%

Carriage bolts, ¼x1½-in., per 100, $1.00. Discount on all sizes up to 1x30-in., 30%.

Coach and lag screws, 1½x$\frac{7}{16}$in., $2.25 per 100, less 40%.

Tap bolts, 1½x½-in., $1.00 per 100. List plus 35% at New York warehouses.

Bolt ends, 1x12-in., 10c. per lb., less 40%.

Nuts, semi-finished, ½x½-in., 2c. each. Discount 70% for $\frac{7}{16}$-in and smaller and 65% for ½-in. and larger.
Case hardened ½x½-in., 6c. each, less 50%.

Rivets, button heads, ½-in., ⅝-in., 1-in. diam. x2$\frac{1}{16}$-in. to 4½-in $5.00* per 100 lb. at New York warehouses; cone heads, same sizes, $5.20* per 100 lb. Rivets, $\frac{7}{16}$x1-in. and longer, 19c. per lb., less 50%. Same discount for tinned. EXTRA per 100 lb. for 1½ to 2-in. long, all dia meters, 25c.; ⅝-in. dia., 35c.; ¾-in. dia., 75c.; 1-in. long and shorter, 75c.; longer than 5-in., 50c.: less than 200 lb. 50c.; countersunk heads, 45c

Washers, cast iron, ½-in., $7.00* per 100 lb. at New York warehouses; ⅝-in., $6.00* per 100 lb

*For immediate delivery from warehouse.

Machine Requirements and Industrial Construction

Equipment Wanted

Calif., Covelo—Round Valley Union High School Dist., J. S. Hogshead, Secy., will receive bids until Apr. 1 for a 14 x 6 lathe with a 12 in. Universal chuck and 9 in. Independent chuck, quick change gears and compound rest, countershaft to be supplied in addition to all accessories.

Ill., Chicago—Dept. of Public Works, A. A. Sprague, Comr., will receive bids until Mar. 30 for a 12 ton crawler crane, 12 ft. radius, for Bureau of Streets, also a 5,600 lb. capacity gasoline power crane, 28 ft. radius, for Bureau of Engineering.

Ind., Hammond—Northern Indiana Public Service Co.—gasoline motor driven crane with ½ to ¾ yd. clam shell bucket and a 25 to 40 ft. boom mounted on caterpillar traction.

Mass., Cambridge (Boston P. O.)—Boston Machine Screw Co., Tudor St.—miscellaneous tools and equipment for proposed addition to plant.

Mass., Chelsea (Boston P. O.)—S. Kysnes, 142 Webster Ave.—miscellaneous tools and equipment for proposed repair and service garage. Estimated cost $40,000.

Mass., Lynn—Gallant Motor Co., 319 Essex St.—miscellaneous tools and equipment for proposed repair and service garage. Estimated cost $50,000.

Pa., Pittsburgh—Carnegie Steel Co., Carnegie Bldg., C. F. Miller, Purch. Agt.—two 15 ton cinder yard cranes.

Pa., Pittsburgh—Jones & Laughlin Steel Corp., Ross St.—one 5 ton overhead crane for Aliquippa Works.

Pa., Pottstown—Pottstown Metal Products Co.—pneumatic compressors and riveters, 75 ton capacity.

Tex., Waco—Missouri, Kansas & Texas R.R., St. Louis, Mo., G. E. Scott, Purch. Agt.—machinery and equipment for proposed addition to Bellmead shops, here. Estimated cost $60,000.

Tex., Wichita Falls—E. H. Blanton—one bolt cutting machine, two drill presses and 1 lathe.

Ont., London—S. Gallagher, King St.—tools and equipment for proposed repair shop and garage. Estimated cost $100,000.

Ont., Niagara Falls—Niagara Wire Weaving Co.—28 or 30 in. band saw machine with cast iron tilting table and guards.

Que., Montreal—Barbeau & Greenblat, 1430 Clarke St., machinery and equipment for garage and repair shop.

Opportunities for Future Business

Calif., Bakersfield—Kern County awarded contract for the construction of a machine shop, etc. Estimated cost $14,000. Noted Feb. 24.

Calif., Red Bluff—State Highway Comn., will soon award contract for the construction of a maintenance station including machine and blacksmith shops, etc.

Calif., San Francisco—City is having plans prepared for the construction of a hangar, shops, station buildings, etc. M. M. O'Shaughnessy, City Engr.

Calif., Wilmington—Wilmington Boat Works, Inner Harbor, is having plans prepared for the construction of a machine and blacksmith shop, etc. Estimated cost $90,000.

Conn., Hartford—Spencer Turbine Co., I. Spencer, Pres., 484 New Park Ave., plans the construction of a 1 story, 75 x 210 ft. plant. Estimated cost to exceed $40,000. Private plans.

Ga., Columbus—Golden's Foundry & Machine Co., manufacturers of machine shop products, has work under way on the construction of a 5 story addition to factory.

Ill., Chicago—Clarke Sanding Machine Co., 1215 Maplewood Ave., machinery manufacturers, awarded contract for the construction of a 1 and 2 story, 43 x 125 and 100 x 110 ft. factory at 3815 Cortland St. Estimated cost $40,000.

Ill., Rockford—George D. Roper Corp., South Main St., awarded contract for the construction of a 1 story, 170 x 170 ft. plant for the manufacture of pumps and enameled products, etc. Estimated cost $250,000. Noted Mar. 17.

Ind., Bloomington—L. Lewis, 317 North College St., is receiving bids for the construction of a 2 story garage and repair shop. Estimated cost $40,000. Private plans.

Ind., Evansville—Chicago & Eastern Illinois Ry. Co., 66th St. and Union Ave., Chicago, Ill., is having plans prepared for the construction of shops here. Estimated cost $200,000. L. C. Hartley, Ch. Engr.

Ind., Ft. Wayne—Dewey-Diehm Co., 3234 Lafayette St., is having plans prepared for the construction of a 1 story, 55 x 70 ft. garage and repair shop. Estimated cost $45,000. Private plans.

Ind., Indianapolis—Link-Belt Co., South Belmont Ave., awarded contract for the construction of a 1 story, 80 x 181 ft. factory. Estimated cost $50,000.

Ind., Indianapolis—Meridian Service Co., Meridian St., will soon receive bids for the construction of a machine shop and service station at 2436 North Meridian St. Estimated cost $75,000. Vonnegut, Bohn & Mueller, 610 Indiana Trust Bldg., Archts.

Ind., Indianapolis—Thornburg, Lewis Co., 3839 East Washington St., awarded contract for the construction of a 2 story, 80 x 180 ft. machine shop and garage. Estimated cost $50,000. Noted Feb. 10.

Mass., Chicopee—Municipal Light Board, is receiving bids for the construction of a 3 story, 60 x 70 ft. garage and repair shop on Front St. Estimated cost $85,000. H. J. Tessier, 1132 Main St., Springfield, Archt.

Mass., Wakefield—A. G. Walton & Co., Heard St., Chelsea, plan the construction of a 1 story garage and repair shop on Mechanic St., here. Estimated cost $40,000. Architect not selected.

Mass., Framingham—Butler Motor Corp., 46 Kendall St., is receiving bids for the construction of a 1 story, 55 x 100 ft. addition to repair and service garage. Estimated cost $40,000. E. R. Haberstrok, 102 Irving St., Archt.

Mich., Grand Rapids—F. D. Avery, is having plans prepared for the construction of a 6 story, 50 x 150 ft. garage at Bond and Ottawa Sts. Estimated cost $150,000. Robinson & Campau, Archts.

Minnesota—Commission of Administration & Finance, Capitol, St. Paul, will receive bids until Mar. 29 for the construction of four maintenance buildings for State Highway Dept. at Duluth, Crookston, Morris and Wellmar respectively. State Highway Dept., 1246 University Ave., St. Paul, Engr.

Mo., St. Louis—A.B.C. Auto Sales Co., 3519 Page Blvd., awarded contract for the construction of a 4 story, 72 x 90 ft. garage at Page and Easton Aves. Estimated cost $50,000.

Mo., St. Louis—Universal Automobile Service Co., C. R. Felton, Pres., Missouri Theatre Bldg., is having preliminary plans prepared for the construction of a 6 story, 150 x 150 ft. garage at Delmar St. and Grand Blvd. Estimated cost $700,000. Architect not selected.

Mo., St. Louis—Ramsey Accessories Mfg. Corp., 1107 North 15th St., manufacturers of automobile accessories, awarded contract for the construction of a 1 story, 40 x 180 ft. factory at 4375 Parkview Pl.

N. H., Manchester—A. L. Gadboro, c/o New Hampshire Auto Co., 1631 Elm St., is receiving bids for the construction of a 2 story, 60 x 100 ft. repair and service garage. Estimated cost $50,000. J. N. Guertin, Beach St., Archt.

N. H., Nashua—City, P. D. Sargent, Mayor, is having plans prepared for the construction of a 1 story, 60 x 200 ft. garage and repair shop on Dearborn St. S. Belanger & Son, 308 Main St., Archts.

N. J., Hoboken—Delaware, Lackawanna & Western R.R., awarded contract for the construction of a 1 story 158 x 192 and 55 x 85 ft. garage, etc., on 14th St. Estimated cost $220,000.

N. J., Newark—Thatcher Furnace Co., J. J. Richardson, Supt., 39 St. Francis St., is having sketches made for the construction of addition to factory at George and Komorn Sts. Estimated cost $40,000. Private plans.

N. Y., Albany—Albany Railway Co., awarded contract for the construction of a 1 story, 180 x 180 ft. garage. Estimated cost $150,000.

N. Y., Albany—Capitol District Transportation Corp., subsidiary of the United Traction Co., 598 Broadway, New York, N. Y., plans the construction of a garage and service station at Erie and Champlain Sts, here. Estimated cost $110,000.

N. Y., Yonkers—Otis Elevator Co., 11th Ave. and 26th St., plans the construction of a machine shop. Estimated cost $50,000. Private plans.

O., Cleveland—Marquette Metal Products Co., W. S. Jack, Pres., 16606 Waterloo Rd., awarded contract for the construction of a 1 story, 100 x 200 ft. factory. Estimated cost $75,000.

Pa., Philadelphia—Imperial Type Metal Co., W. Yearger, Pres., 1226 North Howard St., manufacturers of printers' equipment and supplies, awarded contract for the construction of a 1 story, 41 x 90 ft. addition to plant at Aramingo and Ontario Sts.

R. I., Pawtucket—Superior Cabinet Works Inc., 93 Newall St., plans the construction of a mill. Estimated cost $40,000. Architect not selected.

R. I. Providence—H. L. Scott Co., 101 Blackstone St., awarded contract for the construction of a 2 story, 50 x 70 ft. machine shop. Noted Mar. 10.

Tex., Slaton—Atchison, Topeka & Santa Fe R.R., 80 East Jackson Blvd., Chicago, Ill., is having preliminary plans prepared for extensions and improvements to railway yard including roundhouse and machine shop, etc. to increase the facilities 50 per cent. Estimated cost $275,000. C. F. W. Felt, Ch. Engr.

Wash., Grotto—The Northwestern Portland Cement Co., Dexter Horton Bldg., Seattle, awarded contract for the construction of a machine shop, etc. here. Estimated cost $600,000.

Ont., Port Arthur—Port Arthur Ship Building Co., plans the construction of a 1 story plant. Estimated cost $300,000. Private plans.

Ont., Toronto—Fess Oil Burners, L. L. Jacobs, Mgr., 65 Trinity St., manufacturers of oil burning equipment, plans the construction of a 3 story factory on King St. E. Estimated cost $50,000 to $100,000. Private plans.

Que., Three Rivers—Canada Iron Foundries, awarded contract for the construction of addition to plant. Estimated cost $200,000.